AUSTRALIA'S NUMBER ONE ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

Registered by Australia Post — publication No. NBP0240.

MAY 1983

AUST $2.10 NZ $2.60

WIN THIS MARANTZ COMPACT DISC PLAYER

BUILD YOUR OWN BREATH TESTER

HAVE A FLUTTER WITH ELECTRONIC ROULETTE

TWO SPECIAL OFFERS INSIDE

SONY
THE ONE AND ONLY

The Sony CDP101
The magic of digital audio becomes a magnificent reality.

Digital Audio is a revolution. The greatest advance in home music reproduction since the gramophone record. As you'd expect, Sony is the leader of this revolution with its magnificent CDP-101 player that offers you original studio master quality at home.

For the technically minded, the specifications read more convincingly than any superlatives • flat frequency response over the entire audible range • dynamic range and signal to noise ratio over 90dB • perfect channel separation • immeasurable wow and flutter • negligible distortion.

Sony's CDP-101 uses an optical laser pick-up (incorporating three micro processors), it is easier to use than a conventional turntable and connects easily to your existing system.

Other features include • fully automatic linear skate front disc loading • automatic music sensor • dual function digital readout of playtime • audible fast forward and reverse • 10 function wireless remote control.

Compact Discs Last Forever

Just 12 cms in diameter, the Compact Disc plays up to 60 minutes of music. It's protected from scratches, dust and finger prints by a plastic coating; and because the pick-up is a laser beam, deterioration is non-existent. Reproduction remains perfect virtually forever.

Hundreds of titles will be available with many more to follow from major companies such as CBS.

CDP-101 Specifications

Frequency Range	5Hz-20kHz ± 0.5dB
Dynamic Range	more than 90dB
S/N	more than 90dB
Channel Separation	more than 90dB (at 1kHz)
Harmonic Distortion	less than 0.004% (at 1kHz)
Wow and Flutter	immeasurable

The CDP-101 will be generally available May 1 thoughout Australia but for a demonstration now, contact Sony for the name of your nearest dealer.

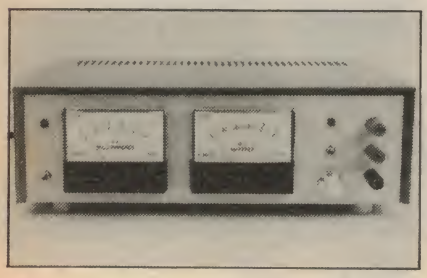
Sydney (02) 2660655, Adelaide and N.T. (08) 212 2877, Brisbane (07) 44 6554, Perth (09) 323 8686, Melbourne (03) 419 3133, Launceston (003) 44 3078, Wollongong (042) 715777.

AUD 0372

AUSTRALIA'S LARGEST SELLING ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

Volume 45, No. 5
May, 1983



Our new switchmode power supply has an adjustable output voltage from 3 to 50V and a maximum 5A output at voltages up to 35V. The first article this month discusses the general principles of switchmode operation. See p58.

This alcohol breath tester could be a smash hit at your next party, even if it does scare a few guests into walking home. Construction is simple and calibrating the unit is even more fun! Details on page 82.

On the cover

You could win this magnificent Marantz CD-73 Compact Disc player, valued at $999. All you need to do is enter the EA/Marantz crossword competition (see p45). Find out more about the player in our in-depth review starting on p44.

FEATURES

SPECIAL OFFERS AND COMPETITION

HIFI, VIDEO AND REVIEW

PROJECTS AND CIRCUITS

PERSONAL COMPUTERS

COLUMNS

DEPARTMENTS

"ICS helped take me from fish and chips to silicon chips."

— A true ICS student story.

It's a long way from the counter of a take away food bar to an electronic technician's work bench. But that's what George Raftou achieved in under three years with ICS training. This is his story.

"I wanted a career, but I'd left school early, so I didn't have much hope. I couldn't afford to go on apprentices wages. And because of my education they wouldn't even have me at tech."

That was three years ago, about the time George saw the International Correspondence Schools coupon in a magazine.

"I don't know why I picked electronics. I just figured with all the stereos and TV's around there seemed to be a lot of opportunities."

Study on full wages.

"The best thing about ICS was that I could study when it suited me and earn good money at the same time."

ICS guided study helped George progress quickly. Systemised lessons, study notes and the guidance of a tutor make ICS programs one of the most personalised methods of learning. You learn at your own pace, taking time over difficult areas, rushing through subjects known to you.

After just one year, George passed his first PMG exam. This enabled him to join an electronics school that normally wouldn't take anyone who had left school so early.

"I joined halfway through the year, but was right up with the class," George told us.

Today, George Raftou works with a leading electronics company servicing calculators. He hopes the next promotion will see him in the company's computer division. All that achieved in less than three years.

Turn your hobby into a career.

Like George Raftou you can use ICS training to enter the world's fastest growing industry.

Check the ICS electronics courses listed below then nominate a specific course in the coupon. We'll send you information without cost or obligation.

1. Basic Electronics.
2. Electronics Technician. Approved by TETIA.
3. Electronic Instrumentation and Control Systems.
4. Electronic Technology.
5. Electronics Maintenance.
6. Radio-Electronic Telemetry: electrical and electronic aspects of telemetering.
7. Amateur Radio Operator's Certificate of Proficiency.
8. Digital Electronics.
9. Data Processing.
10. TV Servicing. Approved by TETIA.
11. TV Principles.
12. Electrical Engineering Technician.
13. Electrical and Electronic Drafting.
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New Zealand: 45 Courtenay Place, Wellington 1. N.Z. 0547

ICS

ICS 074 M&W

Editorial Viewpoint

Nobble the drink/driver

This month we are featuring an alcohol breath tester as one of our constructional projects. It uses a semiconductor gas sensor and is similar in principle to a number of commercial breath testers which can accurately reflect alcohol content in blood. Our project is presented more or less lightheartedly since without accurate calibration it cannot be taken seriously.

Even so, with the rough calibration procedure described in the article it could be a useful instrument. It could, for example, indicate that a person still has a substantial blood-alcohol content on the morning after a "binge". That is a very useful attribute and could avoid a number of serious possibilities for the person concerned, such as loss of driver's licence, injury to self or others, or loss of life.

The big qualifier in all of this is that the driver concerned would have to be conscientious in using the tester. First, he or she would have to turn it on, wait for it to "purge" itself and do the test. And then, if the result is that the driver has a substantial blood alcohol content, he must decide not to drive. The question is, how many people are sufficiently responsible to do this?

Unfortunately, the evidence is such that a large number of people still deliberately drink and drive. The early success of the random breath testing appears to be wearing off. Partly this is because people perceive that the risk of being caught is not as great as they first thought; partly it is because the tests are not truly random. In NSW at least, testing cannot be performed in the vicinity of hotels and clubs.

When you think about it, this represents a particularly callous compromise on the part of the politicians and lobbies concerned. It balances the likely loss of business and employment against an unmeasureable amount of human misery.

Finally, there is evidence that some people, having been tested and duly charged with having been over the limit, are then allowed to drive away! They may eventually lose their licence but that is not at all certain. They can drink and drive another day.

To my mind the drink/driving laws will have to be far more rigidly enforced to solve the problem of our unacceptably high road toll. The penalty for driving with more than the prescribed blood alcohol content should be automatic loss of licence for a six-month period and a heavy minimum fine. Breath testing by itself cannot work.

Leo Simpson

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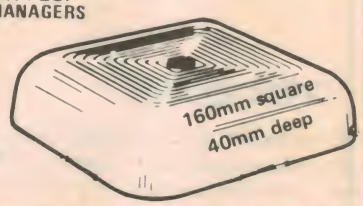
zero inflation - zero

BUY EARLY TO AVOID ALL SPECIALS SHOWN ON THESE PAGES ARE EITHER THE SAME

Smoke Detector

CONSUMER FLOP – CONSUMER FLOP
CLUB, HOTEL, HOSTEL & MOTEL MANAGERS
PLEASE NOTE

Cat. LA5006



- Contains Americium 241 Ionization Chamber
- Contains very loud solid state buzzer
- 12 month factory warranty.

One of the greatest consumer flops of the last decade was the Ionization Chamber Smoke Detector. Even though it is a brilliant product (reliable compact, easy installation, fail-safe etc) it just did not sell. Human nature being what it is finds safety-oriented products just not worth the investment. We all know that accidents and fires never happen to US!! As smoke is the greatest killer in a fire, the market research gurus thought that such a product would have a wide appeal. When they were $49.50 no-one wanted them. The price fell to a very reasonable $29.50 and still they stayed on the shelf. We have now been instructed to clear them for less than ⅓ of $29.50.

A BARGAIN – ONLY $14.50

INCREDIBLE WIRE & CABLE SALE!!

We have made an amazing scoop purchase of quality cables. Because we do not have the room in our warehouse we must move it FAST! Sorry, you must buy in 100 metre quantities (as the cable is on 100 metre hanks) – but CHECK THE SAVINGS!!

Cat. No	Description	Sale Price	Normal Price	SAVE
WB1701	Fig. 8 light duty Grey Spkr. cable	$7.50	$15 (100m)	50%
WB1702	Fig. 8 med. duty Grey Spkr. cable	$8.50	$18 (100m)	54%
WB4504	Twin screened (round sheath) audio cable	$20	$42 (100m)	52%
WB2000	75 ohm TV light duty coax	$18	$28 (100m)	35%

UP TO 54% OFF NORMAL 100m COST!!

JUMBO SPEAKER CABLE

Now you can have super-quality cable without breaking the bank! Each conductor contains a MASSIVE 259 strands of 0.12mm wire!! It could carry 30 amps! Great for Hi Fi or high power amps.

Only $2.50/m
100m $2.00/m
Cat. WB1732

LIQUID CRYSTAL DISPLAY

ONLY $2.95 each
$2.50 each 10+

AMAZING LOW PRICE!

We have done it again! Once again Jaycar has secured a quantity of valuable LCD displays. Once again we are passing them on to you at prices that will make our competition green with envy!
Basically we have a 5 digit x 18mm high (that's BIG) LCD display. But there is a snag, and here is where you save. Normally this display would sell for around $20 - if it had the connecting pins bonded to the glass substrate. But this display just has the metallization on the glass substrate. Too hard to connect you say? No, not at all!!
We have discovered that a humble Molex pin is JUST PERFECT as a connector! You slip the Molex pin onto the edge and superglue it in place. You then have a permament connection, a great LCD display and have saved a fortune to boot! (Instructions for fitting the Molex pins as well as FULL DATA and connection diagrams on the LCD are supplied.
And what do you pay for this LCD display? Only $2.95 each or $2.50 each 10 up. Staggering value. Cat. ZM9015
Pack of 50 Molex pins (only 42 required) Cat. PI6540 Only $1.00

CAR COMPUTER

A BARGAIN

SAVE $20
MAY ONLY

HURRY LIMITED STOCKS!!!

The Sparkrite Car Computer has been acclaimed as easily the best unit in the under $200 market in Australia. We believe that it has features that make the $700 units look silly!
But despite the devaluation of the dollar and despite inflation for the month of MAY ONLY we are slashing $20 OFF the normal price. That's right! You save but you must be quick!! We have strictly limited stocks and when new shipments arrive the price could well go over $200!
We don't have a great deal of space to list the dozens of features here but hurry if you want to join the hundreds of Australians who are SAVING MONEY DAILY with the Voyager Car Computer. (Note professional drivers could recoup the cost of the unit within a year after adopting more economical driving habits as shown by the computer).
THIS OFFER IS STRICTLY LIMITED TO THIS MONTH ONLY! REMEMBER! THE VOYAGER GIVES INSTANT FUEL CONSUMPTION AS YOU DRIVE ALONG – IN L/100 Km OR MPG!
Cat. XC2010 $179 SAVE $20

FEATURES

- INSTANT FUEL CONSUMPTION IN LITRES/100KM AND MPG!! (MOST OTHERS HAVE ONLY ONE OF THE ABOVE) JUST SWITCH FROM ONE TO THE OTHER AS YOU DRIVE ALONG.
- INSTANT SPEED, TIME AND OTHER FUEL DATA.
- VISUAL AND AUDIBLE EXCESS SPEED ALARM.

IDEAL RALLY COMPUTER!

BELOW $200 ONLY $179

JABBER GRABBER FLOP

We thought that you would agree with us that a good quality FM home antenna would be a good idea. You didn't, and we got caught with stock.
What to do? Well they are STILL a great FM antenna for home use, but at this new price you would be silly if you did not grab one for better FM reception. (For more info see our ads around NOV-DEC 1982). The Jabber Grabber sold for $29.50, well, sort of sold anyway. It was probably too expensive. But at $19.50 – another story.
We aren't making anymore after this and it does work well. If you need ground plane whips they are only $7.95 each.

JABBER GRABBER – Cat. AA2002 $19.95
FM WHIPS for ground plane or car FM reception Cat. AA2003 $7.95 each
Special car base for whips – Cat. AA2004 $2.95 each

BELOW COST EA & ETI

But only at our Carlingford store. That's right, to encourage you to visit our Carlingford store you can buy the LATEST ISSUE of EA or ETI for ONE DOLLAR! That is definitely BELOW our cost price. But ONLY at the carlingford store.
(The post and packing charges make mail ordering EA & ETI uneconomical)
PLEASE DO NOT ASK FOR THIS OFFER AT OUR YORK STREET STORE

only $1 ☆☆☆☆☆☆ BELOW COST

LOW COST WALKIE TALKIES

ONLY **12.50** ea

SUPER VALUE!

Last year we sold hundreds. This year despite sales tax increases and inflation we have held the old prices!!
FEATURES: Crystal controlled transmitter
Morse code send
Voice send
Inbuilt antenna
Of all the low cost walkie–talkies that we have seen, these work the best.

devaluation sale!

PRICE AS 12 MONTHS AGO, LOWER OR HAVE NOT BEEN REVALUED! **DISAPPOINTMENT!**

BARGAIN OF THE CENTURY

low cost hi fi

3 – WAY SPEAKER SYSTEM
$29.95 a set
2 SETS (6 SPKR) FOR STEREO
ONLY $49.96

FREE! HI FI CABINET DESIGN WITH EACH SET

Woofer not to same scale as other components

That's right a 3–WAY Hi Fi speaker kit from only $24.98!!
Each kit contains a massive 10" (250mm) woofer, cone midrange and DOME tweeter!! You also get, at no extra charge, the special crossover capacitors!
The system is rated at approximately 20 watts RMS so it is ideal as an economical but reasonably powerful main Hi Fi unit or as a second system for another room or outdoors.
Each 3 way kit comes with a recommended enclosure design which you can build yourself easily!
You would normally pay well over $60.00 for the equivalent from major kit speaker suppliers so this represents an outstanding bargain!

BUT HURRY ONLY 250 PAIRS

Sensitivity of system 93dB/1m/1 watt
Cat. AK 3700
P.S. Bonus. These speakers are made in JAPAN, not a South Asian country.

COMPUTER TRANSFORMER BARGAIN ONLY $29.50

We have secured a quantity of a power transformer at a never-to-be repeated price. This transformer is ideal as the basis of an S-100 power supply, but can be used for many other computer or general power supplies.
SPECS: Primary 240VAC – Secondary 1: 15VAC 2 amp – Secondary 2: 15VAC 2 amp – Secondary 3: 8VAC 8 amp.
A typical DC supply could be ±15VDC @ 1.5A & 5VDC @ 8A or ±12VDC @ 2A & 5VDC @ 8A.
This transformer would normally sell for around $50 only $29.50. Brand new stock.

MORE EDGE CONNECTOR BARGAINS

Over the past 6 months we have sold thousands of quality PCB edge connectors. And STILL we have more bargains!!

Edge Connector No.1 Cat. HE 8655
This component has a 0.1" pitch 72 way (2 x 36) configuration. Each contact is heavily gold plated and bifurcated for lower contact resistance. The 0.025 square terminations will PC mount or take one level of wire-wrap. The body is moulded in high quality Diallyl Phalate with integrally moulded mounting feet on the ends. Outstanding quality for the price.

1 – 9 $2.95
10+ $2.45

Edge Connector No.2 Cat. HE 8656
This component has a 0.156" pitch 86 way (2 x 43) configuration. Once again each contact is heavily gold plated and bifurcated. The termination is of the solder-lug type. The body is identical in fashion to the HE 8655

1 – 9 $3.45
10 + $2.95

Fully Guaranteed $12.50

~~$36.50~~

INTRIGUING

For years and years 240V mains powered strobes have been selling for between $30 and $40. Even kits are around $36. So why is it that Jaycar can sell a 240V strobe – guaranteed – for $12.50?
We can tell you for a start that we're not selling them below cost. Even at $12.50 we're doing OK.
Why so cheap?
Well they were made for a well known electronics chain. Their Q.C. (Quality Control) Department rejected them on the grounds that around 5% of them were faulty. That was an unacceptable figure considering the very good name that the chain has in this country. All goods were rejected (even the 95% good ones) and sent back to the importer.
The importer came to us with his problem. We said that we would sell them PROVIDED we could offer a 90 day guarantee on the item.
Whilst all stock has been checked and the duds weeded out we STILL feel that even at $12.50 you deserve a comeback if we sell you faulty goods.
So that's it. You get a 240V strobe that is perfectly OK for $12.50.
Compare THAT with the $36.50 that you will pay elsewhere.
It's almost too good to be true except for one thing. It's true.
FULL 90 DAY WARRANTY – Cat. XM7005

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News Highlights

Spacelab heralds new era of space manufacturing

Factories in space may one day produce materials which cannot possibly be made on Earth if research by European and United States organisations pays off.

"Materials processing in future space factories may in time be more important than the use of space for telecommunications satellites" says Johannes Schubert, head of the space division of Messerschmitt-Boelkow-Blohm, the main aerospace company in West Germany and a leader in European plans for manufacturing in orbit.

A milestone on the path towards the commercial use of space will be the launch later this year of Europe's manned "Spacelab" on board the Space Shuttle. The product of 10 years of development by the 11 nation European Space Agency, Spacelab is made up of two modules, one pressurised and manned by technicians and a pallet containing experimental apparatus open to vacuum.

The Space Shuttle will carry Europe's Spacelab into orbit later this year.

On its first mission Spacelab will carry out solar and Earth sensing experiments as well as tests of various materials under weightless conditions, but officials of ESA see this as only the first step.

If the technical problems of launching large orbiting structures can be overcome and finance is available from governments and industry, large factories could be operating in orbit by the year 2000, Jacques Collet, an ESA planning official has stated.

Considering the cost of launching materials into orbit, the best candidates for space manufacturing are products of great value which can be made more effectively (or perhaps exclusively) under weightless conditions, from lightweight raw materials which take up little volume. Promising areas include metallurgy, pharmaceuticals and crystalography.

A number of US companies have already signed agreements with NASA to carry out experiments on board the Space Shuttle. These experiments will be carried free of charge as long as the results are made public.

Video is big business says Time Inc

When Time magazine put a computer on its "man of the year" cover in January this year it knew what it was about. The magazine's parent, Time Inc, has had extensive experience with computers, cable television and video distribution.

Time's cable system, American Television and Communications, is the largest in the United States, and its cable service, Home Box Office, has nearly 12 million subscribers and has just gone into the movie business. A Teletex service is also under development.

The importance of the video division of Time Inc became apparent last year when it overtook publishing as the company's largest source of income. One of Time's newest and costliest ventures is TV-Cable Week, a magazine introduced last month listing cable offerings and available cable services by geographic area. Time executives say that the weekly, in which they plan to invest $US100 million over the next five years, has a bigger potential market than any of the group's other magazines.

Home Box Office has also gone into partnership with Columbia and CBS to make movies, and has introduced children's programs on its cable service, including a new show by Jim Henson, creator of "The Muppets".

Time Inc has also been buying up cable TV franchises around the country and has launched an intensive effort to sign up subscribers. Chief executive officer of Time Inc, Mr J. Richard Munro, acknowledged that cable systems are expensive to set up, but claims "there are few places we can spend money better than in basic cable television".

Reagan under fire on research controls

Tight controls on the disclosure of results of research and development in the United States would not only fail to enhance national security but could be a "disaster" for the country's research position and worldwide competitiveness according to representatives of the electronics industry.

The Reagan administration is currently attempting to tighten up controls over the publication of research results, arguing that many "militarily critical" aspects of research are too readily available. In response, the National Academy of Sciences has called for unfettered dissemination of new findings and research results.

Multinational corporations such as IBM and General Electric Co also argue that tighter controls on disclosure will do more harm than good. IBM's vice president Lewis Branscomb states that new obstacles to transferring proprietary information to its own foreign plants "could be catastrophic" for a company that earns more than half its profits from overseas operations.

President Reagan – wants to restrict "militarily critical" technology.

New optoelectronics course at University of NSW

In response to an international shortage of trained specialists in lasers and optoelectronics a new series of courses has been introduced for the first time this year at the University of NSW. The courses are offered to third year students in the School of Physics and aim to provide direct experience in the design, construction and operation of typical laser systems and other optoelectronic devices.

Senior lecturer Dr George Paul of the School of Physics believes that the current shortage of trained technical staff is hindering the growth of an industry which is likely to become very important to Australia. In less than 20 years lasers have been applied in a host of industries, including chemical and metallurgical processing, and have become important in medicine, defence and communications.

Dr Paul says that the courses will bring Australian students up to date with developments in the optoelectronic industry. "Students will experience design, construction and operational aspects of many types of lasers as well as a spectrum of optical systems. Project work will include a study of laser processing of materials and the results of such work will be very useful to supplement our current store of knowledge on laser use."

Paul Szabo (left), Andrew Venning and Dr George Paul (right) examine laser equipment at the University of NSW.

Problems for Japanese robot makers

Robot manufacture in Japan is faltering in the face of falling sales and increasingly difficult demands from customers.

The leading manufacturer, Fujitsu-Fanuc, has cut production back from 100 machines per month to 70, and Kobe Steel, a manufacturer of spray-painting robots, expects sales to fall short of the 300 target for the 1982 fiscal year. Kawasaki Juko also expects a 25% drop in sales this year.

Reasons given for the slowdown include the world recession, difficulties in the automobile industry, one of the main customers, and inadequate sales organisations.

In an effort to overcome the slump interest is turning towards the development of integrated automatic systems (rather than stand-alone robots working on production lines designed for humans), combined with an earlier examination of the requirements of customers and the provision of more versatile robot designs.

A greater interest in combining sophisticated electronics with robot systems is also evident. The recent agreement between electronics company NEC, robot manufacturer Dainichikiko and the market analyst and trading company Sumitomo Shoji indicates a concerted effort is being made to combine expertise from several fields in future robotics activities. Previously robot manufacturers often ignored the latest developments in electronics, and left their product to go it alone in the marketplace.

The steam loco: set for a comeback?

With the increasing price of oil, and constrained by the high capital cost of electrification, US railway interests are looking at a modern version of the steam locomotive as an answer to high railway running costs.

The original steam locomotive died out because it was woefully inefficient; only about 5%, compared with a diesel at around 30%. It also created a lot of smoke and other pollution. So the emphasis is on a "modern version" which is designed to overcome these shortcomings.

An American firm, American Coal Enterprises, has designed a completely new style steam loco which does not even look like a conventional steam train. In fact, it looks more like a pair of modern diesel locos.

Its firebox will be computer controlled (no fireman) to ensure minimum smoke, gases, cinders, dust or ash, and maximum heat from the coal. It is expected that this should raise the efficiency to 15%.

In model form only at the moment, the planned prototypes will be called ACE 3000, and production is scheduled to begin at the end of this year. With diesel fuel now costing over four times that of coal, for the same energy, the company feels that its new steam loco has a bright future.

Micros could help disabled to walk

A 22-year-old American student, Nan Davis, took 20 steps late last year. They were faltering, with most of her weight supported by an adapted parachute harness, but they were a significant achievement – the first steps she has taken for four years, since being paralysed in a car crash on the night of her high school graduation.

Miss Davis is believed to be the first paralysed person to "walk" using an experimental "computer-controlled electrical stimulation-feedback system" developed at the biomedical laboratories of Wright State University, Ohio.

Dr Jerrold Petrofsky, the director of the laboratory, and Dr Chandler Phillips, an expert in cardiac muscle mechanics, designed and programmed the computer control unit that has allowed people with spinal injuries to exercise paralysed muscles, ride a bicycle, and now in at least one case, walk.

Electrodes are attached to the patient's paralysed leg muscles and to a non-paralysed muscle elsewhere in the body. The computer interprets nerve signals sent to the non-paralysed muscle and redirects the message to the legs.

For her first walk Nan Davis was wired to a small desk top computer, although the Wright University researchers are planning equipment which can be carried in a shoulder bag. The ultimate aim – still many years away – is to allow the paralysed to walk again by implanting microprocessors under the skin near paralysed muscles to take the place of the surface electrodes used at present.

NEWS HIGHLIGHTS

Contract to AWA for Aussat ground stations

Australian participation in manufacture of equipment for the AUSSAT domestic satellite has received a boost with the award by Hughes Aircraft Corporation of a contract to AWA Ltd to build part of the ground facilities for the system. The contract, worth more than $5 million, is the first awarded by Hughes under its commitment to involve Australian industry in the satellite program.

AWA will build two components for the Tracking, Telemetry Command and Monitoring station to be located in Sydney. An alternative TTCM station will be built in Perth, with monitoring stations in Adelaide and Brisbane.

The role of the stations is to ensure that the two AUSSAT satellites are correctly positioned in space some 36,000km above the equator, and that the switching system in the satellites is operated correctly.

The two components to be built by AWA are the Communications Systems Monitor, which measures specific parameters of the communications system and spacecraft, and the Station Management Sub-System, an automated facility to assist staff to run the TTCM stations efficiently.

AWA will be responsible for the overall design, manufacture and supply of both components for the ground control stations. The current contract has provision for further AWA Communication Systems Monitors to be incorporated in satellite systems to be supplied by Hughes to other countries. The systems will be built at AWA's plant at North Ryde.

Australians tune in to UOSAT-Oscar 9

The $A400,000 Surrey University amateur satellite put into orbit 16 months ago is now regularly "talking" to the world thanks to an on-board speech synthesiser. The voice synthesiser allows the satellite to report directly to schools and colleges in English, and it is estimated that at least 2000 groups are currently receiving its bulletins.

The 48kg satellite is claimed to be the first in space able to report back to Earth by voice so that radio amateurs and students can pick up messages with relatively simple equipment costing around $500.

The voice synthesiser reports readings from 59 gauges and the positions of 45 switches in the spacecraft and announces the amount of solar particle radiation impinging on the satellite, the amount of current being supplied by the solar cells and the temperature of the batteries and the primary computer.

Surrey University at Guildford, near London, built the satellite, known officially as UOSAT-Oscar-9, and reports that it is being monitored from 2000 points around the world. This figure is derived from those who have been in touch with the satellite's control centre in Surrey, and university officials believe that the actual audience is much larger. The largest number of reports has come from Australia, followed by the Middle East and the United States.

The satellite broadcasts on 145.825MHz and is in a polar orbit with a 96 minute period.

Business briefs

- Electrical wholesaler Telcon Australia Pty Ltd has acquired Amtex Electronics, a company specialising in the manufacture of photovoltaic systems and components, switching power supplies and associated products. Mr Jim Kuswadi, founder of Amtex, has been retained as manager of the new Telcon division.
- A new Australian-based communications and entertainment company has been jointly formed by James Hardie Industries Ltd, Taft Broadcasting Company and Broadcast Investments Pty Ltd. Initially the new company will acquire Hanna-Barbera Pty Ltd (animation and television programming) from the present joint owners, James Hardie and Taft and the business of KGC Magnetic Tapes (videotape production) from James Hardie.
- Dick Smith Electronics has opened two new stores, one in Townsville, Queensland and one in Gosford, NSW. Both stores will carry the full range of Dick Smith products.

UK moves to control peak load demand

Moves are afoot in the United Kingdom to allow electricity authorities to control their customers' use of electricity by remote control. Electricity suppliers throughout the world share the problem of "peak load" – power consumption can be several times less at 3am than at 8am, for example, while suppliers must install and maintain equipment able to supply the peak load.

In the small hours billions of dollars worth of equipment lies idle or is underutilised.

In parts of the United States electricity suppliers are able to disconnect consumers' air conditioning and heating equipment by remote control to reduce peak load, and three methods of central switching are presently being tested in the UK.

One system uses control pulses sent out over the mains wiring while another uses auto-dialling telephone lines for the same purpose. The most favoured system however is "Radio Teleswitch", a method of impressing digital control signals onto a radio carrier wave, which will be tested on the BBC's Radio Four.

A special receiver in the customer's junction box will detect the control pulses that are phase-modulated onto the carrier waveform while the radio listener will hear only the normal program material.

In addition to allowing the authority to switch consumers' appliances on and off to lower the peak load, in return for lower electricity tariffs, the system would allow the ultimate sanction against those who have not paid their bills – a coded radio signal that leaves them without heat, light or power.

Optical fibre contract to Austral

The optical cable at the centre of this photograph has more capacity than both larger copper cables combined.

Austral Standard Cables Pty Ltd, one of Australia's largest suppliers of telecommunications cables, has announced two major contracts for the supply of optic fibre cable.

Telecom Australia has ordered 38 kilometres of 12-way optical fibre cable while the Northern Territory Electricity Commission has ordered 20 kilometres of four-way cable. Cable for the first contract, worth $300,000, has already been supplied to Telecom and will be laid between Melbourne's Exhibition Street Exchange and Dandenong. Each pair of fibres in the cable has a capacity of almost 2000 simultaneous telephone conversations.

The cable ordered for the Northern Territory was specially developed to meet specifications of Electricity Commission consultants and will be used to carry control signals in conjunction with 11,000V power cables.

Computer-controlled car suspension

Toyota has developed a microcomputer-controlled car suspension system to overcome the problems of compromise between a comfortable ride and good handling characteristics.

Apart from the microcomputer, the system consists of shock absorbers with a two way valve and electrically controlled actuators. A mode selection switch allows the driver to select a soft ride for slow urban driving or rough roads, or a "sports" setting for high speed driving. In addition the microcomputer automatically increases the resistance of the suspension on one side of the car during cornering and hardens the suspension at the front or rear of the car during heavy braking or acceleration.

The system has been launched on Toyota's "Soarer" model which is currently sold only in Japan, but it is expected to shortly become available on models such as the Celica and Supra which are exported.

Colour TV Game

All the excitement of the big, expensive TV games – without the big expense! This colour TV game console lets you decide which games you want to play – at a suprisingly low cost. The console comes complete with two individual joystick controllers, readily accepts any of the plug-in microprocessor games modules. All you have to do is connect the console to your TV antenna input, plug in the game and you're away! The game is absolutely safe: it's battery operated so it cannot harm you or your TV in any way if used according to instructions. Cat. Y-1160

GAMES MODULES
Car Race Cat. Y-1165 **$25.00**
Motor Cycle Cat. Y-1163 **$29.00**
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You can have from one to four drives, giving up to 1260K bytes – that's more than a megabyte! Two models available, the 1043 is a quad density unit with controller that packs 77 tracks each of 16 sectors on one 134mm disk. The result is an incredible 315,000 bytes of storage per disk. The 1023 is an add-on unit.

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1043 – Cat. X-3205 Cat. X-3208 Add-on Drive
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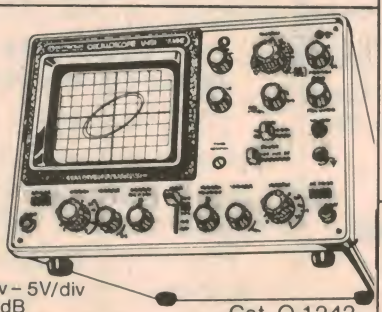

Vertical Sensitivity: 5mV/div – 5V/div
Bandwidth: DC – 15MHz, –3dB
Rise Time: 24ns
Input R and C: Direct 1 Mohm, approx. 30pF
Power Requirements: 120-240V, 40W

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Model V-152B

For the service bench, the development laboratory, the technical college, university or school – or even the serious hobbyist or amateur who simply wants a top-of-the-line CRO with out breaking the bank, we now have the outstanding Hitachi V-152B 15MHz Dual Trace Oscilloscope. And it costs no more than the previous CRO's we've sold which didn't have anywhere the number of features of the Hitachi V-152B.

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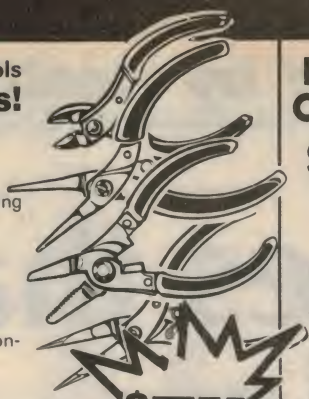

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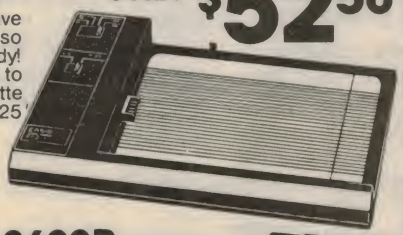

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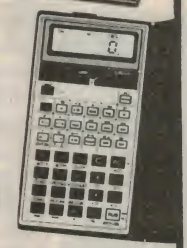

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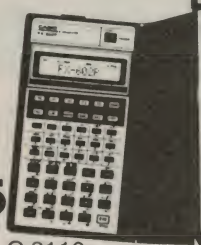

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- Variable temperature control from around 200 to over 500 degrees C.
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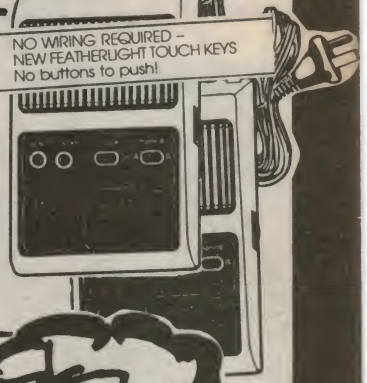

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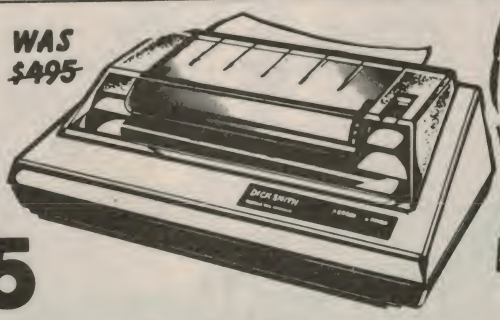

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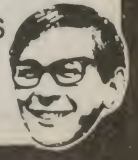


New planes that radar can't see

by JIM SCHEFTER

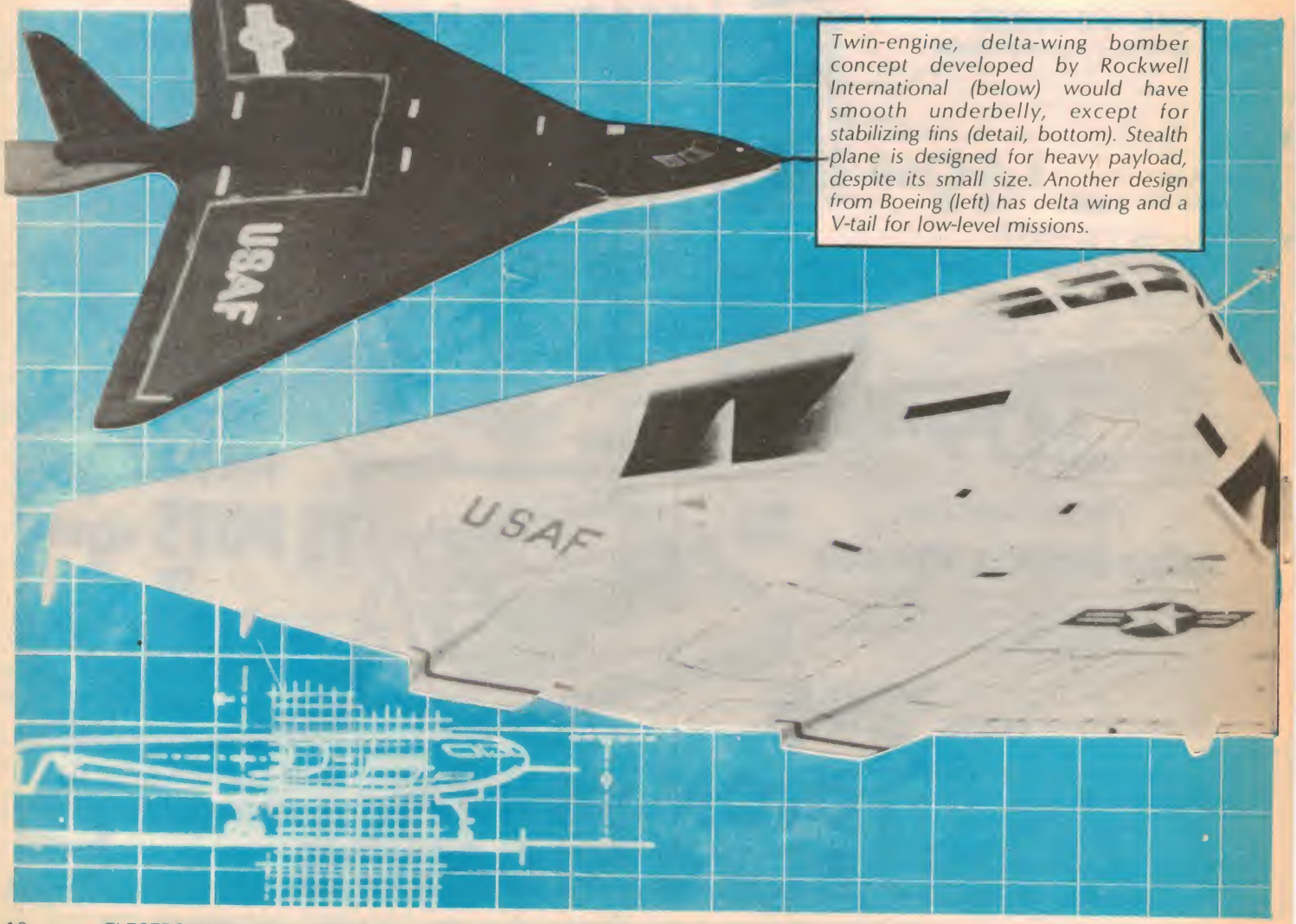
SHAPED like a broad, flat wing with only a smoothly blended windscreen revealing its cockpit, the bomber skimmed across barren polar terrain at nearly 1000km/h. Barely 100 metres below, ice floes vibrated to the roar of its concealed jet engines. The early warning radar fence lay behind, its operator unaware that the first line of defence had already been penetrated.

More radar waited ahead. Hugging the terrain to take full advantage of hills and valleys, the flying wing crossed out of the tundra. Despite its size and speed it created just a flicker on glowing scopes. It was no more than a hummingbird darting south.

But this bird, still a paper airplane that won't fly before 1987, will be no harmless little avian. The popular word used to describe it masks the most secret US technology program in four decades:

Stealth.

This multi-billion-dollar development, already under way in



Twin-engine, delta-wing bomber concept developed by Rockwell International (below) would have smooth underbelly, except for stabilizing fins (detail, bottom). Stealth plane is designed for heavy payload, despite its small size. Another design from Boeing (left) has delta wing and a V-tail for low-level missions.

a classified and guarded Northrop Corp facility midway between two major Los Angeles freeways, is aimed at producing a new bomber that is virtually undetectable by radar. A secondary effort to produce a modified B-1 bomber with a low radar profile is under way at a Rockwell International plant in nearby Palmdale.

And a third project, by the Lockheed Corp, already has produced at least three prototype stealth fighters. Flying from a secret field near Groom Lake, Nev, and from Eielson AFB, Alaska, since 1979, two of these triangular-shape craft have crashed, but for reasons not connected to their strange design. The third reportedly continues to fly test missions in both extreme heat and cold.

Taken together, the Pentagon expects these futuristic aircraft to alter the balance of military power into the next century.

How will a bomber-size aircraft deceive radar that is itself state of the art? What new technology is on the drawing board to create a machine that will penetrate enemy airspace with impunity?

Some answers are emerging from this highly classified program. Others undoubtedly will remain among the United States' most tightly kept secrets. Briefings on stealth technology, when authorised by the US Air Force, are sketchy. Even individuals allowed to talk insist that their names be concealed.

Even so, it was possible to put together a partial look at how the best aeronautical engineers in the world are designing stealth-type aircraft. Some of the picture, necessarily, is informed speculation by experts.

The stealth bomber, is being designed to fly intercontinental distances at low altitudes at about Mach 0.85. "High-altitude attack is not a wise idea because it gives the enemy a longer time to look at you on the way in," one observer said.

The Air Force itself discourages the word "stealth". It prefers the term "low observable" and calls Northrop's project the ATB, or advanced-technology bomber.

"When you talk about stealth", a high-ranking Air Force officer told me, "you're talking about the ability to offset the enemy threat to your penetration."

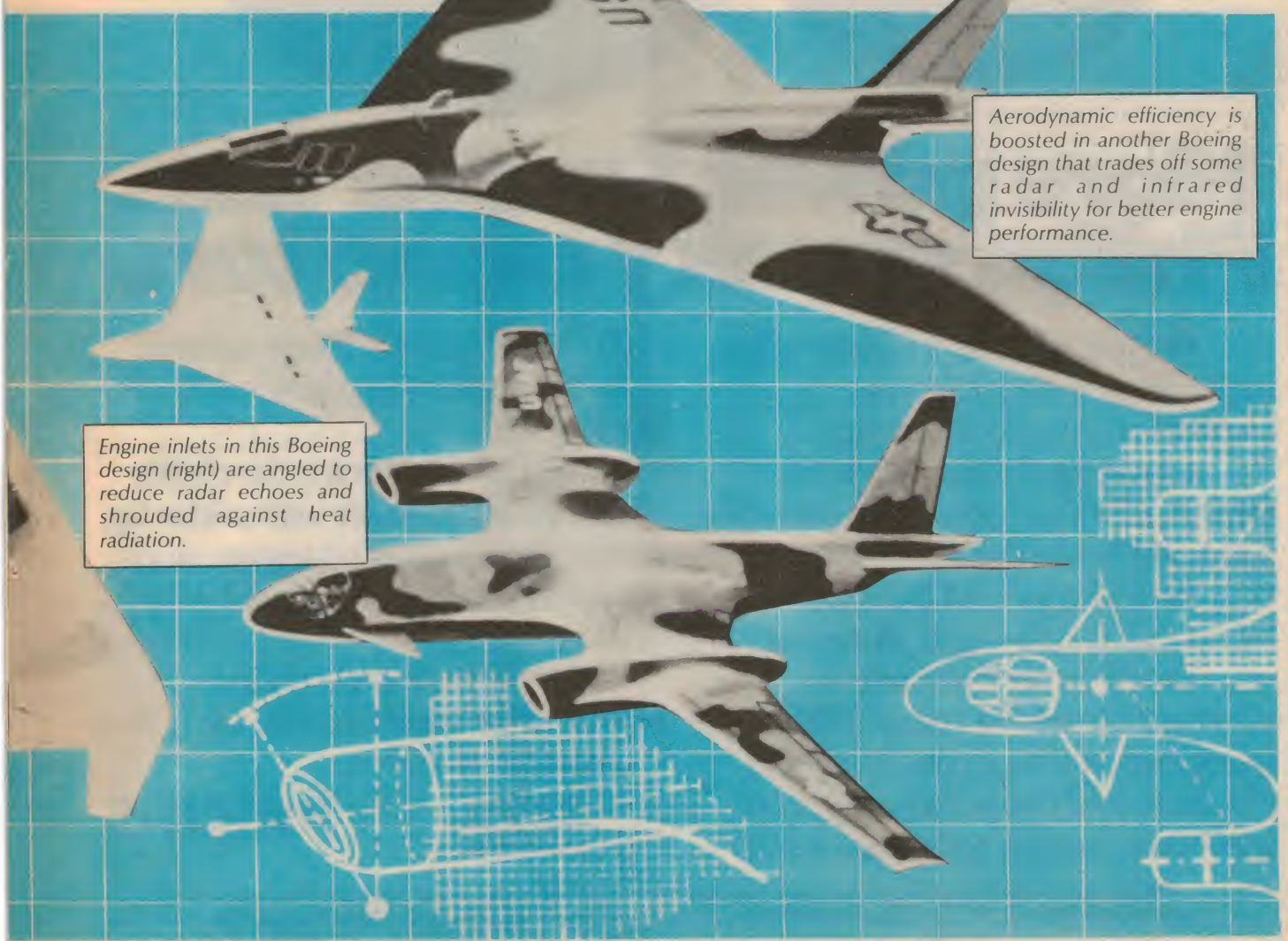
To do that takes an aircraft with a unique shape, built with materials and coatings that both absorb and deflect radar signals. It takes innovative designs to conceal jet engines within the aircraft body. And it takes a host of new electronics gear aboard the craft to isolate and confuse enemy radar.

But the first step is designing the aircraft itself. Air Force and industry officials stress that reducing radar cross section – the reflecting surface actually seen by radar – is the major factor in playing aerial hide-and-seek. Cross section is measured in square metres, as seen head-on by defence radars.

For instance, the ancient B-52 that remains the primary intercontinental bomber has a massive radar cross section of about 100 square metres. Its tall, vertical stabiliser and heavy body make it an ideal radar target. Even worse, its large wing-slung engine pods concentrate radar signals and echo them back with brilliant clarity.

A shrinking target

Rockwell's original B-1, that Jimmy Carter refused to



Aerodynamic efficiency is boosted in another Boeing design that trades off some radar and infrared invisibility for better engine performance.

Engine inlets in this Boeing design (right) are angled to reduce radar echoes and shrouded against heat radiation.

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Planes that radar can't see

build, produced a radar image of just 10 square metres. The B-1B, now being reworked in a stealth version that will fly in 1985, echoes a cross section of just a single square metre.

That's a flashing alarm compared with the stealthy bomber on Northrop's drawing board. It reportedly will have a radar cross section of one-millionth of a square metre. A hummingbird is bigger.

Designers will achieve this strikingly small radar cross section with a number of design innovations. For example, sharp edges and abrupt angles, often seen on aircraft wings and control surfaces, produce strong radar echoes. So there will be none of the new planes. Northrop's bomber will be a low-profile flying wing. (Significantly, Northrop also built the original B-49 Flying Wing, which first flew in 1947.) Tomorrows' stealth bomber will take the concept even further, expanding on the so-called blended-body concept

provided by Rockwell's B-1. It's wing-body leading edge will be smoothly rounded, and its delta shape will integrate fuselage, cockpit, and wing into a single flowing wedge. Engines will be buried inside the body, not hung out as tempting radar targets.

Northrop engineers also are wrestling with designs for the vertical stabiliser. Their first choice is to eliminate it completely. If computer analyses point up handling problems with the concept, Northrop may decide to use small twin stabilisers. They would be canted inward to deflect radar rather than echo it.

No information is available about overall size of this flying wing. But it is certain to be low-slung and squat, almost like a Frisbee or boomerang in proportions. All that will make radar sighting more difficult. Yet more is needed.

One solution is to eliminate metal wherever possible. Early versions of radar-absorbing materials, primarily carbon-and-fibreglass composites, were developed by Rockwell for the Hound Dog missile. That technology is being adapted for the stealth bomber.

Recent advances by a number of laboratories, including the Air Force Materials Laboratory at Wright Patterson AFB, Ohio, have led to composite materials that are stronger and lighter than steel or titanium yet do not reflect radar waves. A black fibre-reinforced graphite skin is reported to be the leading contender for Northroip's bomber.

With current technology, materials that absorb some electromagnetic radiation are bonded to stronger titanium. But Lockheed's super-secret stealth fighter is believed to be made largely of Fibaloy, a composite developed by Dow Chemical Co. Fibaloy includes glass fibres embedded in plastic and is said to be strong enough without metal backing to form both the fighter's skin and its main structural members.

The result is a 10,000kg fighter not only stealthy, but small and light enough to be carried inside a C-5A transport

And the Air Force is heavily committed to developing even better carbon composites. That leaves the stealth-bomber designers to consider their jet engines, which can't eliminate metal.

"Jet-engine intakes are high-visibility items for radar," one aeronautical expert told me. "To get enough air into an engine, you need big compressor sections up front. They're very balanced, built to close tolerances, and made of heavy metal."

With front-facing air intakes, that metal echoes radar like a beacon. But the new bomber will have concealed intakes, mounted flush beneath the flying wing. It also may employ a version of a new intake-tunnel configuration being developed for Rockwell's B-1B.

Called the zigzag tunnel, this innovation eliminates the straight-line air flow that also lets radar flash directly into the engine compressor. The new tunnel has twin channels with a series of carefully designed curves that minimises radar reflections.

The expandable throat needed to reduce incoming air speed and prevent a compressor stall in a high-flying supersonic aircraft is gone. The result is a radar fooler. Signals entering the zigzag tunnel reflect back and forth at the curves, instead of echoing a bright reflection to a radarscope.

"We can do it because the B-1B is now a subsonic, low-altitude penetrator," an Air Force officer said. "There's no problem with stalls".

The new flying wing will add another innovation. Its jet-

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Project 82 AR12 — See December EA

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100K OHMS/VOLT CHECKS TRANSISTORS AND MEASURES CAPACITANCE

Q 1040 Multimeter **$72.50**
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From Tokyo Laboratories, Japan

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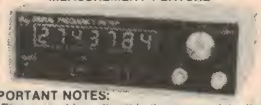
★ 100K OHMS/Volt DC ranges ★ 8.5 UA movement ★ Fuse and diode movement protected ★ Inbuilt oscillator for capacitance measurement. **RANGES: DCV** 250MV, 2.5V, 10V, 50V, 250V, 1000V. **ACV** 5V, 10V, 50V, 250V, 1000V (10K/V). **DCA** 10UA, 2.5MA, 25MA, 500MA, 10A. **ACA** 10A **Resistance** x1, x10, x1K, x10K **Transistors** NPN/PNP **HFE** 0-1000 **ICO** 0-50UA. **Capacitors** 50PF-3UF .01 UF-50UF.

DIGITAL FREQUENCY METER

See Electronics Aust Mag Dec 81-Feb'82
500MHZ, 7 DIGIT RESOLUTION PLUS PERIOD MEASUREMENT FEATURE



IMPORTANT NOTES:
(1) This project is well within the scope of the "not so experienced" as virtually all components are contained on a single PCB.
(2) ALTRONICS USE ONLY THE SPECIFIED INTERSCIL LSI — BEWARE OF INFERIOR KITS THAT DO NOT CONFORM TO THE ORIGINAL DESIGN.

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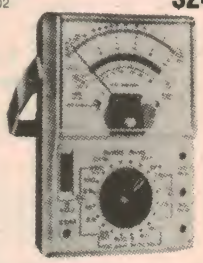
Q 1002 **$24.50**



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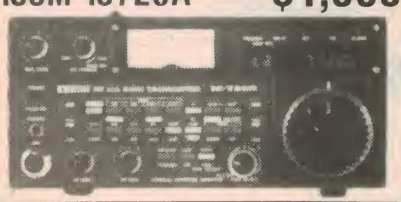

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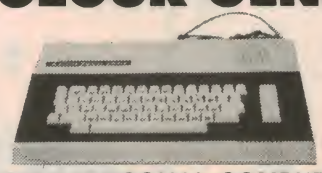

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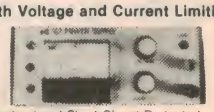

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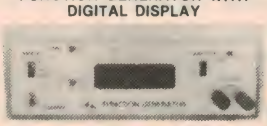

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Planes that radar can't see

The Lockheed SR-71 "Blackbird" reconnaisance plane is coated to reduce its radar signature.

engine exhaust will be cooled and masked, exiting from smoothly faired thrust vents at the trailing edge. That won't affect radar but will help protect the stealth bomber from heat-seeking missiles or detection by infrared sensors.

Northrop's stealth aircraft also will benefit from radar-absorbing coatings first developed for Lockheed's legendary SR-71 Blackbird. That plane got its name from the inky-black coating that reduces its radar signature and camouflages it against the dark sky.

Details on newer coatings are highly classified. But Northrop is said to be including that technology in its flying wing.

B-1B accessories

Avionics will make up the rest of the fighter's approach to radar invisibility. While declining to discuss the electronics that will go into the flying wing, the Air Force provided some details on equipment for the low-observable B-1B.

First, the dish-type radar antenna in the nose of the craft is gone, replaced by a phased-array antenna that resembles a flat, oval plate. "The dish became a radar target itself in some instances," an Air Force official said.

The phased-array antenna never moves. It is angled generally forward, but its radiation is aimed electronically, and it doesn't reflect enemy signals. The system was adapted off the shelf from a radar employed in the F-16 fighter.

The Air Force and Rockwell also eliminated an antenna than ran down the B-1's back like a visible spine. That spine provided angles just made to echo radar. The antenna, part of a programmable defensive-avionics system, will be built directly into the aircraft.

The system is computer controlled and on-board programmable to seek and identify enemy radar or missiles. "These avionics are the current state of the art," the officer said. "They've been tested against surrogate Soviet systems and will defeat anything currently in their radar-antenna inventory and any upcoming threats," he confidently asserted.

The system being developed for Northrop's stealth plane is presumably even better.

"Radar cross section is only one aspect that's going to make a super-penetrator," the officer said. "The other half is the avionics. When you get the radar visibility down very small, you can start manipulating the radar signals so the enemy doesn't see you."

That means stealth-type aircraft will carry new electronic-countermeasure gear to identify a radar station, then transmit just the right signal to erase even the hummingbird speck from its scope. The kind of countermeasure equipment now in use must be powerful enough to obliterate the large radar signatures current aircraft produce. Still, radar operators frequently know something is happening, though maybe not what, when their scopes are jammed.

"If you can use just enough energy to foil each radar set, they won't even know you're there," the officer explained.

If current funding levels continue, the B-1B will be operational in 1986, with 100 of them flying by 1988. To protect against it, the Russians will have to spend five times as much on defences as the aircraft cost the United States, according to an Air Force source. And that's just the start. The Northrop stealth plane now is scheduled to be in the military inventory by 1992. "That will take another five-fold expenditure if they want to even think about stopping it."

Further thoughts on wind-powered generators Pt.2

Last month we gave details of propellers which can be used in wind generator systems. Calculations given in that article demonstrated the need for some form of gearing, such as one of the systems described here.

by T. C. THRUM

There are three transmissions systems which can be used by the hobbyist; V belts, chain drive, and toothed belt. The easiest bearings to use are the agricultural type, which are sealed and mounted in a cradle ready to bolt to a flat surface. They are available to suit a wide variety of shaft sizes and can be purchased from any reputable bearing company. I recommend that one does not use a shaft size smaller than 18mm. The shaft size should be chosen to suit the bearings and pulley available but remember that the larger the shaft diameter the larger the bearings and the greater the friction. The smaller the shaft the more likely it is to snap in strong winds, and the smaller bearings will have to work harder.

The prop should be mounted on the shaft with an accurate flange, and the front bearing should be mounted as close as possible to it. The rear bearing should be mounted 10 to 15cm from the front bearing. The pulley can be mounted anywhere between the two bearings or close to the rear bearing on the outer side. The latter position allows easier modifications and belt changes.

The toothed belt and the chain drive are about equal as far as efficiency is concerned but the chain drive will require an extensive sealed enclosure to repel dust and water and to contain a level of lubricating oil (10-20 grade) such that the lower portion of the chain will be covered. The enclosure need only be made of galvanised iron but one problem to overcome will be sealing the two shafts. A 10mm thick felt pad slipped over the shaft and contact cemented to the cover may suffice.

The main difficulty with this system is to obtain two cogs with a 4:1 ratio that will attach to both shafts. The smaller of the two cogs will need to be in the vicinity of 50mm in diameter. Push bike cogs or a small motor bike rear chain assembly may be suitable. However a lathe and a welder will probably be required to modify the shaft mounting of the cogs. The toothed belt is the best method as only a crude cover is required and efficiency is high. The belt used on the 2 litre overhead camshaft Ford Cortina is ideal but the associated pulleys give only a 2:1 ratio.

The V belt represents the easiest and cheapest approach, using the existing pulley on the alternator and a fanbelt to suit. The pulley for the prop shaft now becomes the problem. Pulleys using the narrow V section are hard to come by as the machinery standard is a slightly wider belt ("A" section). One may be able to use the crankshaft pulley of a car, but the hole size may be a problem and it may not be large enough in diameter. The normal pulley on the alternator is about 62mm therefore the drive pulley needs to be in the vicinity of 250mm for a 4:1 ratio. Some of the V8 engines have pulleys approaching the 200mm size.

The major drawback with a V belt is the friction which is required to make it work. It may be found that the prop will not have enough torque to get the unit started, in which case a looser belt and or a smaller ratio may be required. If the ratio is to be reduced then it may be necessary to rewind the alternator using twice the number of turns with a wire gauge of half the area of the original.

Another alternative is to start with a 24V alternator but the field current may not be sufficient to work satisfactorily on 12V, in which case it will be virtually impossible to rewind.

Wind powered generator system built by the author produces 250W in a 40km/h wind.

Remote sensing

For a 12V system the transmission line from the alternator to the batteries should use the heaviest practical cable. The longer the run the greater the voltage drop and power loss, reducing the overall efficiency. Using the old imperial 7/036 cable, a 30m run has a round trip resistance of 0.22Ω, which seems quite small. But if we pass 20A through this cable the voltage drop is 4.4V and the power loss is 88W. Even if we used a cable four times larger in cross sectional area, we would have a voltage drop of 1.1V, sufficient to prevent the battery from being properly charged.

While every effort should be made to keep these losses at a minimum, such losses as are unavoidable can be compensated for by correct placement and wiring of the regulator. The worst case is where the regulator is left with the alternator and senses the voltage at the alternator output terminals. Since this will

always be higher, by the cable losses, than the voltage across the battery, the battery cannot be fully charged.

The next best arrangement leaves the regulator with the alternator, but extends the sense line from it (via an additional slip ring) to the battery. This reduces the error to that due to losses in one cable only; the common one (usually negative), shared by the battery and the regulator.

All these errors can be avoided by mounting the regulator at the battery, where it can sense the voltage without loss. The excitation current is then taken back to the alternator via a third cable, again using a slip ring. Although there may be losses in the excitation circuit, these will be taken care of automatically by reason of the feedback action. This is the ultimate solution for, while the losses themselves are not eliminated, the errors they create are overcome and the battery will be charged at the correct voltage.

Another reason for placing the regulator near the batteries is that the less there is on the tower the better it is for maintenance. There is nothing worse than trying to climb a tower and make adjustments or modifications in a 40km/h gale.

Incidentally brass is the best material for the slip rings. Copper tarnishes too quickly. The best brushes are automotive starter motor brushes. The wear on these is usually minimal, so second hand ones will probably suffice.

If household power cable is used the brown (red) wire should be used for the +12V, the blue (black) for 0V, and the earth wire can be used to supply the field current from the regulator (at the battery) to the alternator on the tower. The outer sheath will be quite adequate to insulate the 12V, but care should be taken to prevent the ingress of water to the ends of the cable. A point to remember with DC is its electrolysis capability.

It is interesting to note that the early model Dunlite Wind Generator used no regulator and adjustment of the tail selected the maximum charge current. The batteries needed to be constantly monitored so that once they were fully charged the owner had to furl the prop (pull it off the wind).

Applications

Applications can range from charging a 12V battery to running a household. What is the system going to be used for? The answer to this question is the guiding factor for the system design. With the propeller described the average output would be sufficient only to run a few lights. (Fluorescent lights running off inverters is the most efficient method.)

A combination of solar cells and a wind generator can provide an almost constant supply all year round. It is interesting to note that a normal household located at Gawler, South Australia, was powered by a rack of solar cells and a 4.5m 5kW Dunlite wind generator for six months. The automatic diesel back-up was never needed during that period. However, until the cost of solar cells comes down to a dollar a watt they are not really worth considering.

The major drawback of a 12V system is Ohms law. To obtain any reasonable power one needs to draw a lot of current and hence it will either cost a fortune in copper cable or one will have to put up with voltage drop in the line and hence power loss. Also if you wish to construct transistorised inverters you must take into account the saturation voltage of the transistors, producing around 10% loss. If a 24V system is used the saturation voltage is still the same but the supply voltage is doubled so the losses are down to 5%. And, since the current in the devices is now one half, the power loss is now down to 2.5%. This does not include switching losses in the transistors and copper and magnetic losses in transformers.

This installation by the South Australian Dunlite company produces a maximum continuous output of 2kW in a 40km/h wind and is available with a selection of output voltages. Features include a three phase alternator with solid-state regulator and an automatic feathering mechanism to protect the prop and alternator in high winds. A disc brake on the prop simplifies maintenance and installation.

For further information contact Dunlite Power Generation, PO Box 100, Hindmarsh, SA 5007 or offices in other states.

The distinct advantage of the 12V system is the abundance of devices available to suit this voltage – lights, motors, etc. The use of inverters makes the system more versatile but adds expense and complexity, and requires more time and effort.

I prefer a 36V system which operates 32V equipment very nicely. And the small amount of line voltage drop is negligible.

This voltage also lends itself to arc welding but a large set of batteries is required. Also 36V is a good voltage to use for transistor inverters as the common 2N3055 suits the rail voltage nicely with reasonable output power (400W) is possible without requiring paralleled transistors.

The major drawback of the 36V system is that it requires three batteries, hence three times the cost for storage; but you can store three times the energy. Give some careful thought when purchasing car batteries as for a few dollars extra you may obtain ampere hours which will outweigh the extra expense.

(It should be noted that a 36V battery system used with nominal 32V appliances may create overload problems in certain circumstances. When the battery is on charge the voltage could rise above that allowed for in 32V equipment design and, where cable losses are low, excessive voltage could be applied and damage caused. Ed.)

Conclusions

Modifications to both prop and alternator of the wind generator published in July, 1978 EA may increase the output, three to four times. A unit of this size will be suitable for an emergency lighting service. To provide power for household use the propeller needs to be 3.5 to 5 metres in diameter. They are not suited to closed-in suburbia as, besides being unsightly, there is the noise and safety aspect. The tower needs to be at least four metres above the rooftops.

It must be remembered that electricity provided by an electricity trust or commission will be far cheaper than that provided by wind or sun. At the same time, it is interesting to note that the Electricity Trust of South Australia is interested in experimenting with a megawatt unit. They are looking to local industry to produce the complete unit but I suspect the blade will be purchased overseas, since the local industry could not afford the development costs, while overseas companies have had several year's experience.

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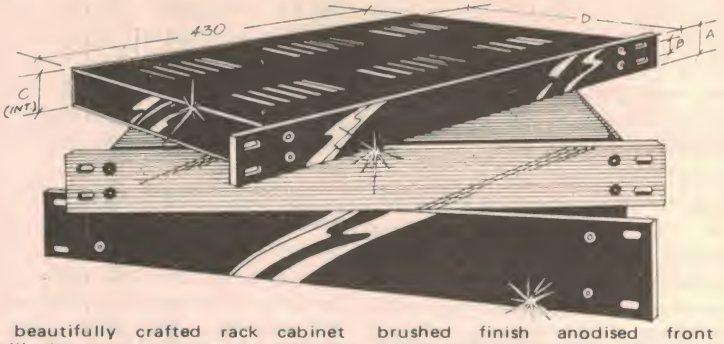

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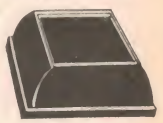

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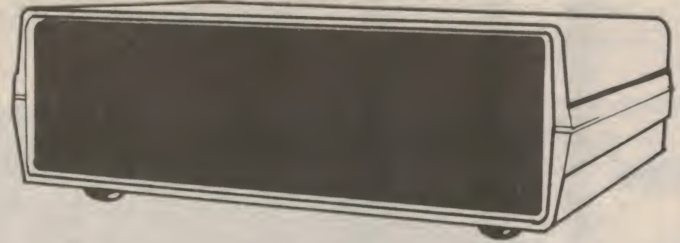

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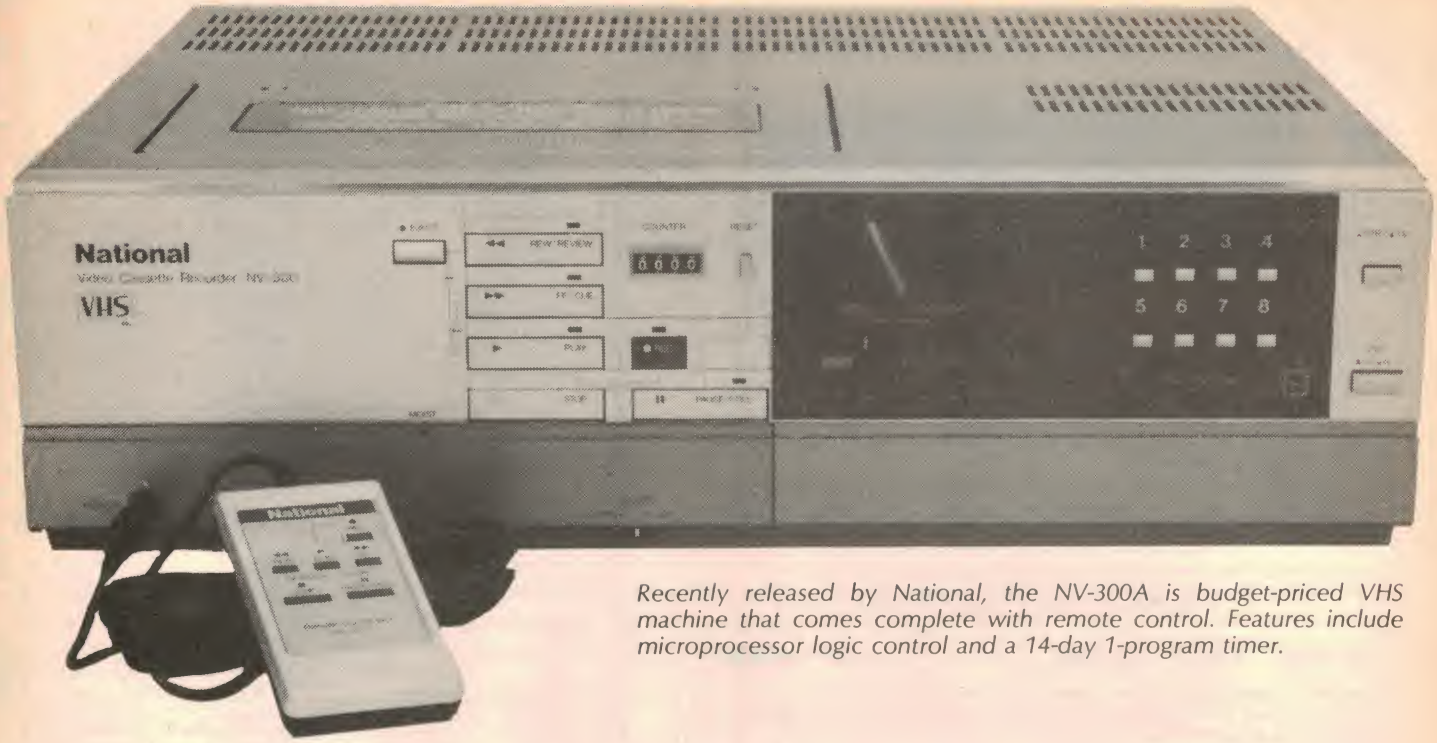


Recently released by National, the NV-300A is budget-priced VHS machine that comes complete with remote control. Features include microprocessor logic control and a 14-day 1-program timer.

Servo systems in video tape recorders

In recording and playing back televison programs on tape, a complex speed and position relationship must be maintained between the spinning drum carrying the heads and the moving tape. This article describes the servo systems used for this function in video recorders.

by MIKE RIDLEY *

In the early days of video recording, the BBC developed a system of videotape recording known as VERA (Video Electronic Recording Apparatus). The video tracks were laid longitudinally similar to the audio system, with a few modifications. High video frequencies require a high tape-to-head speed, and VERA's transport sped the tape past the heads at 508cm/s. For a half hour program the reel of tape was almost 1.5m in diameter, and it took two men to lift the spool on to the machine. The reproduction was good for the time, but because of the many difficulties in tape transport and tape economy, VERA was abandoned.

* *24 Kelvin Avenue, Montomrency, Vic.*

In the meantime the development of the "Quadruplex" videotape recorder (VTR) brought about major design changes. The "Quad" system, still used in broadcast stations, moves the video heads as well as the tape; in other words, by moving the heads, a high head-to-tape speed (writing speed) is achieved. Four video heads are mounted on a single head wheel rotating at 250 rev/sec, and as the tape passes the head wheel video information is laid transversely across the tape with each head scanning approximately 16 lines of video information.

Quadruplex machines are expensive, so a cheaper system has been developed which records a complete field on one rotation of the video head; this head is mounted on a horizontal revolving head drum. The tape is wrapped around the drum in a helical form, so the video track is laid at a slant, as shown in Fig. 1. Unfortunately there is no single standard for helical scan machines (as there is with the quadruplex machines), and it is possible to count well over 10 different helican scan formats; nevertheless, common to all VTRs is the servo system.

In modern VTRs there are usually two or more servos controlling the speed of the head drum motor and the capstan. The head drum servo controls the position and velocity of the head drum, and the capstan servo ensures the correct longitudinal motion of the tape. All video recorders require a servo system in some form, for it is not possible to record or playback a video signal without proper control over the speed of the video head drum and capstan.

Fig. 1 shows the configuration of a typical helican scan format (U-Matic standard), and Table 1 compares the various characteristcs between U-Matic, VHS and Betamax. One video head records a complete field of the video signal, so each stripe of video information represents one TV field; however, it is

not sufficient to record a field at random. To provide stability and minimise picture disturbance the video heads are switched very close to, or in, the vertical blanking period; furthermore, the video signal is laid down in a precise pattern so the vertical sync information appears in the same place on each stripe of video information. The field synchronising pulses of the video signal are also recorded on a separate track, known as the control track, to ensure the correct tape position in the playback mode.

Servos in videotape machines perform four basic functions:
(i) Ensure the video signal is recorded in a precise pattern on the tape with respect to the head position.
(ii) Ensure the rotating video heads are switched at the correct time in record and playback.
(iii) Ensure the heads track accurately over the recorded information during the playback mode.
(iv) Ensure a constant capstan speed.

Servos comprise four main components, as shown in Fig. 2:
(i) A comparator.
(ii) A reference input to the comparator.
(iii) A mechanism to detect the speed and angular rotation of the motor shaft.
(iv) A feedback loop from the motor to the comparator.

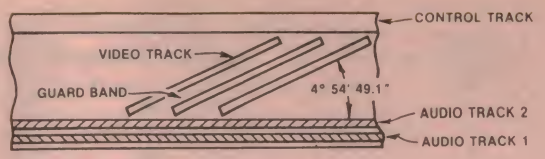


Fig. 1

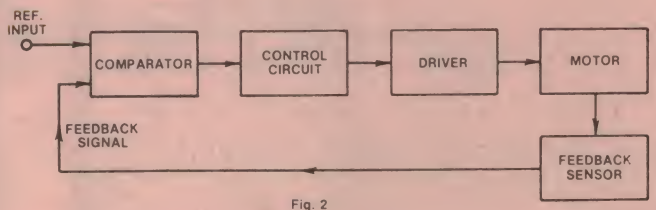


Fig. 2

Speed control

A sync separator separates the sync pulses from the incoming video signal, and the vertical sync pulse is then used as the reference input to the comparator. The motor generates a series of pulses (as direct indications of the motor speed and rotational angle) which are fed back to the second input of the comparator.

If the motor is running at the correct speed, and in step, there will be a constant voltage output from the comparator since there will be no difference between the reference signal and the feedback signal. Should the motor speed increase, for example, then the feedback sensor will sense this increase and feed the information to the second input of the comparator. There is now a difference between the reference signal and the feedback signal, and a controlling voltage is produced which ultimately slows the motor until the correct speed is reached. If the motor speed decreases then the comparator produces a voltage which increases the motor speed. The full operation of the comparator is explained later.

A simplified recording servo system is shown in Fig. 3. It is in fact, two servo loops, one controlling the head drum and one controlling the capstan. The reference input to the head drum comparator is the incoming field sync signal (50Hz) divided by two to give 25Hz, and the feedback input to this comparator is in the form of 25Hz pulses generated from the rotating head drum.

A small coil and a magnet are sufficient components to generate the feedback pulses. The magnet is mounted on the rotating head drum and a stationary coil is located directly beneath the path of the travelling magnet. Each time the magnet passes over the coil, a small "tach" pulse is produced, giving the comparator a direct indication of the head drum speed and position. The resultant error voltage from the comparator is amplified and fed to the head drum brake circuit.

The pulses from the head drum are also fed to a second servo loop comparator, associated with the capstan motor. This is also fitted with pulse generating components and the pulses they produce are fed to the second comparator, compared with those from the head drum, converted to an error voltage, and used to drive an eddy current brake on the capstan motor. In this way the capstan speed and position are locked to those of the head drum. The control track records the 25Hz pulses, derived from the incoming sync pulses, which become the reference pulses during playback.

TABLE 1

Format	U-Matic	Betamax	VHS
Tape Width (mm)	19	12.5	12.5
Tape speed cm/s	9.5	1.87	2.33
Writing speed cm/s	854	583	483
Drum diameter (mm)	110	74.5	62
Video track width μm	85	32.8	49
Maximum tape time (hr)	1.4	3.2	4

Playback servos

Fig. 4 illustrates a simplified playback servo system. The reference input to the drum servo comparator may be mains, local sync, or an internal crystal oscillator. The head drum servo loop behaves much as in the record mode, locking the head drum to the input

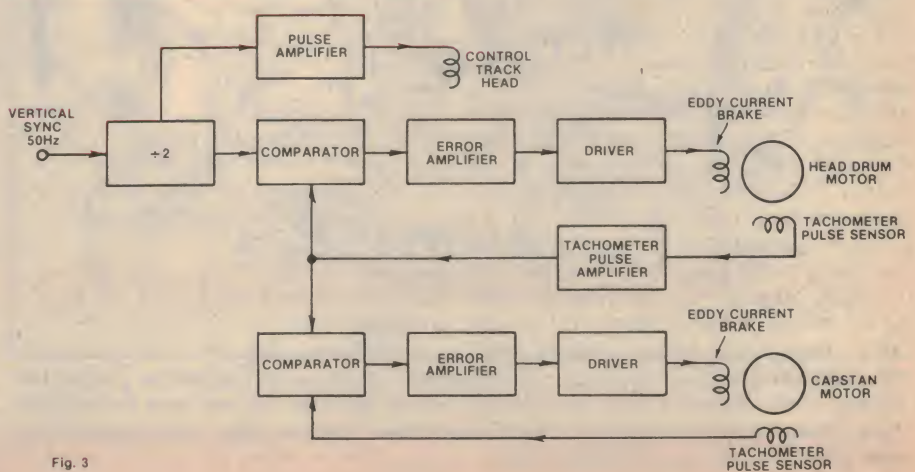


Fig. 3

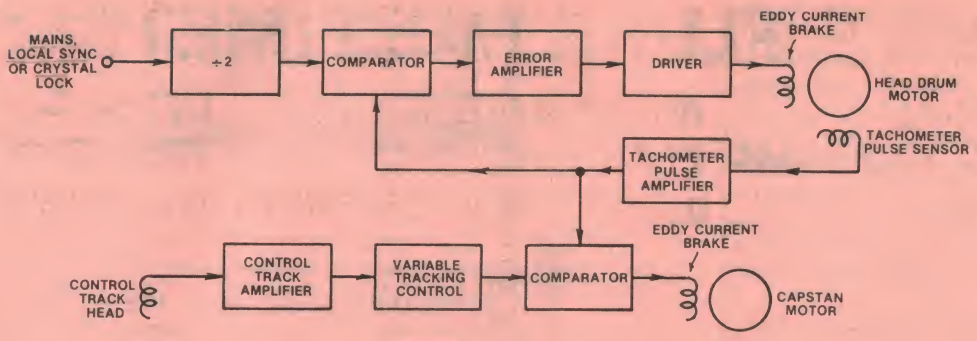


Fig. 4

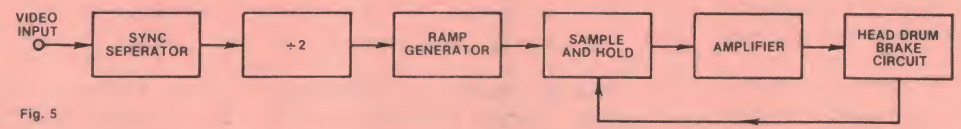


Fig. 5

reference. In addition, the head drum pulses serve as one reference for a second servo loop, controlling the capstan, the second reference being the pulses from the control track, which indicate the tape's position.

This servo system aligns the video tracks under the video heads for correct tracking. Tracking is the ability of the playback head to scan directly over the recorded information for maximum video output. If, for some reason, the playback head has difficulty in scanning the recorded information the video output will fall and eventually degenerate into noise.

At least three variables in video tape systems can cause faulty tracking and necessitate provision of a variable tracking control to adjust the instantaneous head position relative to the moving tape:

(i) Humidity and temperature.

(ii) Out-of-adjustment recording machines.

(iii) Stretched video tape or poorly packed tape.

So far we have mentioned only the basic blocks of a servo system. The next section describes how the comparator produces an error voltage and how the motor speed is corrected.

There are two main methods of comparison:

(i) A ramp waveform sampled by a pulse on either the positive or negative slope.

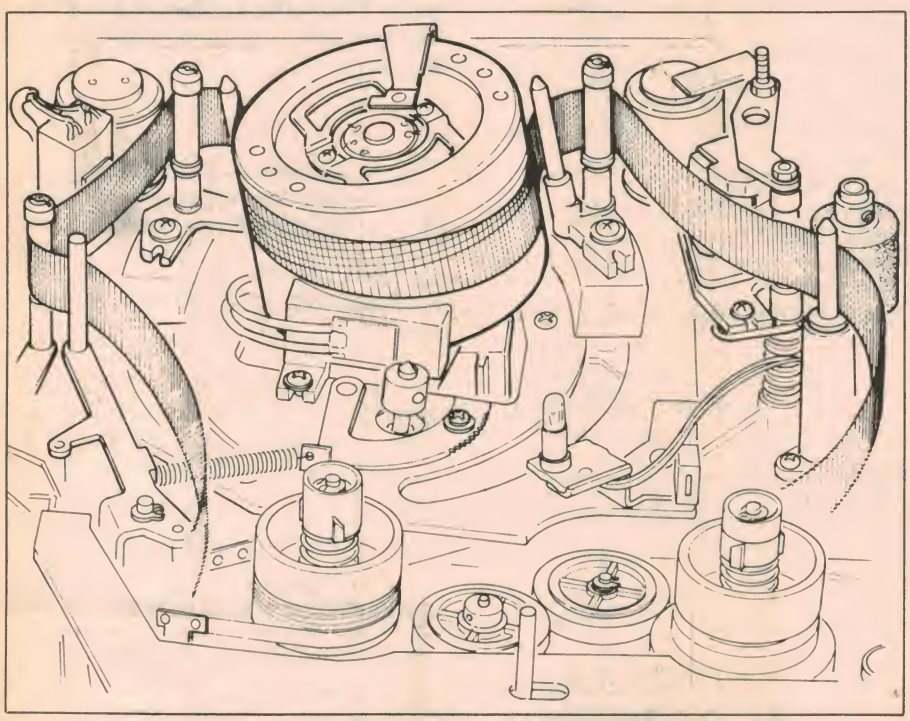
(ii) A ramp sliced at some point to produce a pulse of varying width.

A ramp sampled by a pulse is more commonly used and will be the method described in this article. A typical block diagram of this technique is shown in Fig. 5.

The sync pulses from the incoming video signal are used as a reference input for the ramp generator. A multivibrator, triggered from the reference input, produces a square wave which is then integrated to form a ramp signal. This ramp signal is fed to one input of a gate, while the feedback pulses from the head drum sensing coil are fed to the other gate input.

At the instant a pulse from the head drum is received, the amplitude of the ramp is sampled and this voltage appears at the output of the gate. It will be in the form of a pulse having a duration determined by the duration of the head drum feedback pulse – and which is essentially constant – and an amplitude determined by the time at which this pulse sampled the ramp. The pulses from the gate output are then integrated into a steady DC voltage, amplified as necessary, and applied to an eddy current brake coil.

The DC voltage required to drive the



By courtesy of National Panasonic, this diagram indicates the tape path in a typical M-loading VHS format VCR. In normal play mode, the tape moves from left to right. Note the tilt on the head drum, which puts it at an oblique angle with respect to the tape path, thus producing helical scan.

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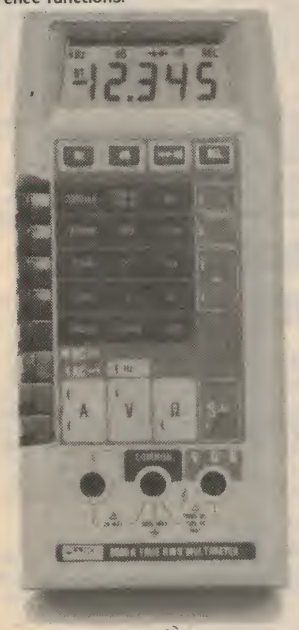

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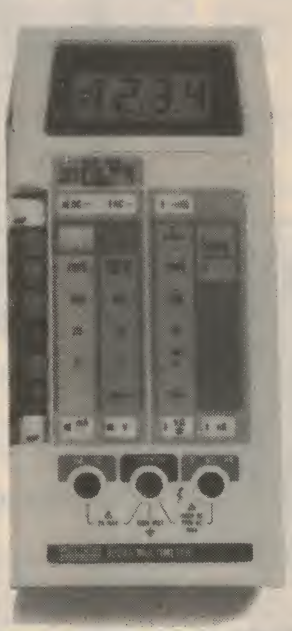

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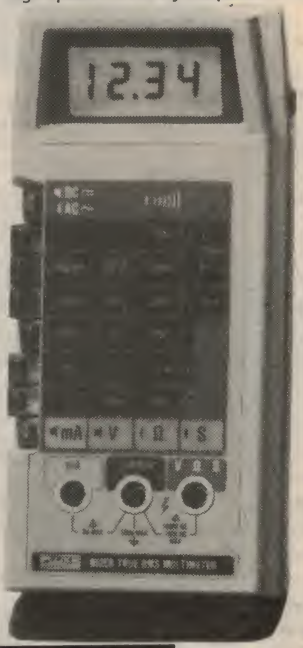

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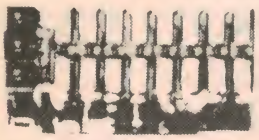

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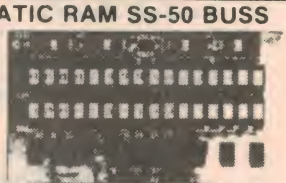

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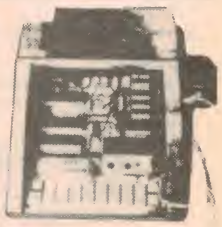

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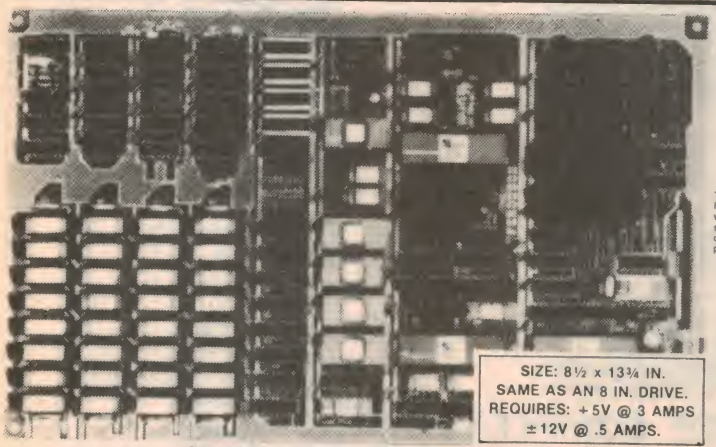

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Servo systems for video tape recorders

head drum at the correct speed is at the mid-point on the ramp waveform, position 1, Fig. 6. If timing errors occur the sampling pulses appear at some other point along the ramp, and the error voltage modifies the braking action until the correct drum speed is reached. The 25Hz sampling pulses pass on the instantaneous value of the ramp at a particular time; the resultant sampled DC value is stored in a capacitor until the next head drum tach pulse. The sampling in simple VTR servos is relatively slow (25Hz), and the errors between samples have to be ignored.

As previously explained, the reference pulses are derived from the incoming video signal in the record mode but recovered from the tape in the playback mode. In the record mode the pulses are as accurate as the source, determined by the standards of the TV broadcasting service.

In the playback mode, the situation changes. The servo now has to cope with both head speed variations and tape errors. In other words, our reference has now changed from a steady source to one off tape, with all the usual tape problems. To cope with these two different conditions, two different ramp slopes, or response times, are used for the two modes.

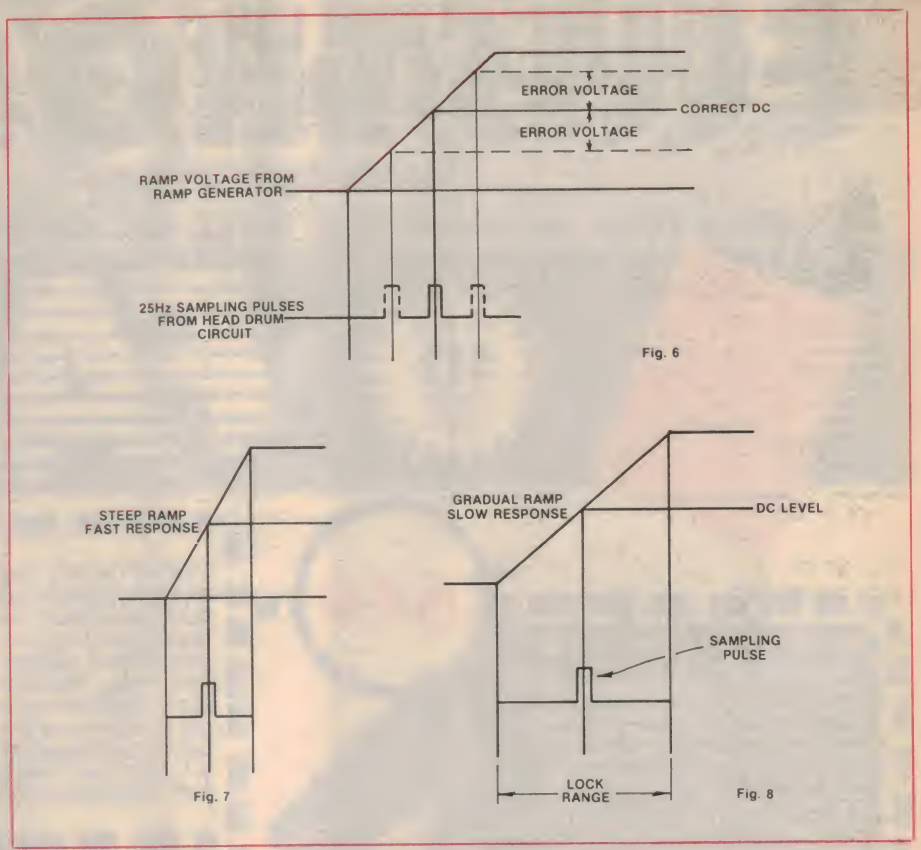
Figs. 7 and 8 illustrate this. Fig. 7 shows a steep ramp used in the record mode. This gives the system a faster response time, at the expense of a restricted range of correction. Because of the accurate and constant nature of the reference pulses, this restriction is not important.

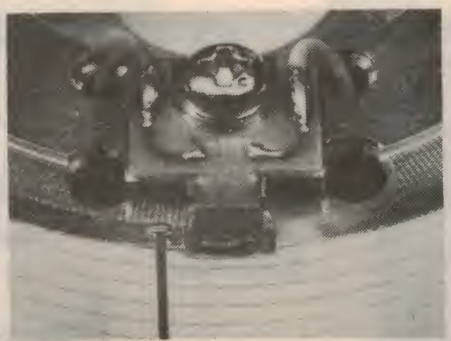
Fig. 8 shows a much longer ramp as used in the playback mode. This is able to cope with a much wider range of sync pulse inaccuracies, such as might be typically encounted off tape, but suffers the restriction of a slower response time, even though this is usually adequate.

Precise control of the head drum speed is important for positioning the head to the video tracks. Mechanical braking is impractical because of the uneven wear on the brake shoes which will not give the required accuracy; however, eddy current braking is often used which is frictionless, in the mechanical sense, and precise.

An AC synchronous motor drives the head drum via a rubber belt; the motor speed is slightly faster than necessary, to give the braking system the required control. A metal disc is mounted on the rotating head drum shaft and a stationary coil is positioned near the metal disc. The coil is so orientated that, when a current flows through the coil, the magnetic field opposes the direction of the disc.

The error signal from the comparator is passed through the coil. A more positive error signal will produce a larger magnetic field which will oppose the direction of the disc and so slow the head drum. A lower error signal will decrease the magnetic field strength, consequently the head drum will increase speed. The eddy current brake is attached to the vision head drum shaft, rather than to the synchronous motor. As the motor runs at a constant speed the drive belt is designed to slip in a controlled fashion to enable braking control.





At left is the motor/drum/head unit from a modern VHS home video deck. The tip of one head is indicated by the arrow. Above is a close-up view of a video head.

Summary

Although the helical scan format is simple, the long tape path tends to highlight timebase errors. Magnetic tape length tends to expand and contract because of friction, humidity changes, and temperature variations. In the record mode the video tracks are stretched and compressed at random, so in replay these unstable video tracks cause serious timing errors, and it is the job of the servo system to correct for these timebase errors. Whatever the format, size or cost, every video recorder/player has at least one servo system but more precise machines could have several servo systems which all interconnect.

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The 74F138 is a high speed 1-of-8 decoder/demultiplexer. This device is ideally suited for high-speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three 74F138 devices or a 1-of-32 decoder by using four 74F138 devices and one inverter.

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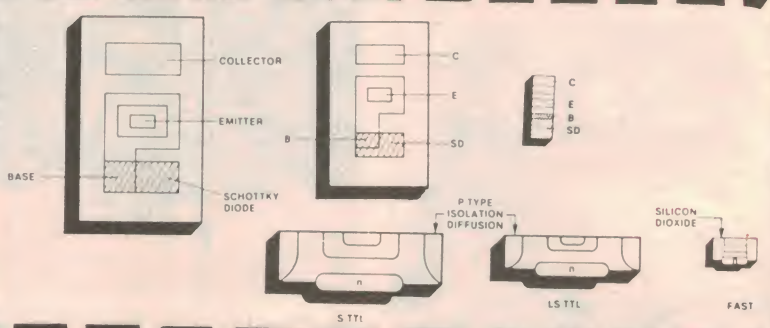

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FORUM

Conducted by Neville Williams

RADIOCOMMUNICATIONS — A new Act with old problems

One of the final actions of the outgoing Minister for Communications, Mr N. A. Brown, was to release for discussion and comment a draft of the Radiocommunications Bill, 1983. If accepted by the new administration, the Bill will replace the Wireless Telegraphy Act of 1905 and subsequent associated legislation.

A press release which reached our office at the same time as the draft legislation described the Wireless Telegraphy Act of 1905 as "outdated" — an understatement, if ever there was one. The old "W.T.Act" was being criticised as inappropriate and out of date long before I became associated with this magazine — and that's more than 40 years ago!

To be realistic, "wireless" transmission and reception in 1905 was still poised halfway between a scientific novelty and something that was seen by a few visionaries as having a possible use for emergency maritime communication. The idea of broadcasting to the public at large would have been 2001 stuff — or whatever the appropriately remote year was in 1905.

The very terminology was expressive:

They called it "wireless" because that was its most startling feature: you could pass messages without using wires!

They added "telegraphy" because, if you wanted to pass a message, Morse telegraphy was the natural and appropriate way to do it!

So we acquired the Wireless Telegraphy Act of 1905, which is still in force today, despite what has happened in between.

BASIC CHANGES

Within less than twenty years, the whole scene had changed. The microphone and speech transmission was taking over from the Morse key, and radio amateur operators were adding their voices to the airwaves, along with an ever-growing number of communication services.

The Wireless Institute of Australia had been established and had formed an association with "Sea, Land and Air" as their official organ. The April 1, 1921 issue of that journal reported the re-establishment of the Radio Relay League in the USA and went on to say:

The two hundred meter wavelength reserved for amateurs is a continual buzz of chatter and amateur traffic. One may listen in any evening to radiophones, continuous wave transmitters and all classes of quenched and rotary spark transmitters.

Subsequent issues detail such interesting items as Australia's first wireless receiving competition, in which entrants were required to submit a log of telegraphic and telephonic transmissions from Charles Maclurcan's experimental wireless station at Strathfield NSW.

Another news item related to the transmission by wireless of time signals from the Greenwich (Eng) Observatory, from Annapolis (USA) and from Bordeaux and Lyons in France. These were being received at the Sydney Observatory as a back-up for time standard checks via cable. They were also being used by survey teams marking the border between South Australia and Western Australia on longitude 129°E.

In the following year (August 4, 1922) a writer in the very first issue of our foundation magazine "Wireless Weekly" looked beyond the era of message handling, time signals and amateur transmissions to public broadcasting, nationwide and especially to the outback:

The (weather and market) reports finished and Dad switched off and looked at the clock. "In a quarter of an hour" he commented, "The Amalgamated Wireless will be sending out their concert."

Mother, Sarah, Jane and Billy, who were killing time as best they could, smiled. They knew these wonder concerts and thoroughly enjoyed them. At the appointed time, Dad switched on again, tuned in the concert wavelength, picked up the music and connected the loudspeaker. . ."

Even at that time, these rapidly expanding activities and concepts, and especially the wireless receiving competition, sat oddly against a basic provision of the Wireless Telegraphy Act of 1905, which made it an offence to reveal the contents of a wireless message which you might happen to intercept, or even to reveal the existence of such a message!

NOT A WORD TO BESSIE!

Clause 36 (3): A person shall not, without lawful authority, divulge or make any use whatsoever, of any portion of the text of any message transmitted or received by any station, whether situated in Australia or elsewhere, or disclose in any manner whatsoever the existance of any such message.

Inappropriate as it might have become in the early '20s, that clause is still on the statute books, but honoured far more in the breach than the application. Indeed, a great deal of what is transmitted, these days, is intended for public consumption and discussion.

Fittingly, the secrecy provision appears to have been omitted from the proposed new Act although clause 83 would seemingly leave the way open for it to be re-introduced by way of regulation:

Regulations:

83 (1) The Governor General may make regulations not inconsistent with this Act, prescribing matters:

(m) the gathering and dissemination of information relating to radio transmission; and

(n) any matter incidental to or connected with any of the foregoing.

At an editorial level, we have long held the view that the secrecy of radio messages should, if necessary, be preserved by technical rather than legal means. I refer to the use of scrambling,

carrier switching, etc. Although such measures may be capable of penetration, they are still likely to be more effective against a chronic eavesdropper than a purely regulatory "Thou shalt not. . ."

Yet I fear that the urge to regulate for secrecy is still implicit in the draft legislation in another guise. In Part IV, to do with Receiver Licences, we encounter the following – and I quote relevant extracts only:

Interpretation

35 In this Part, "receiver" means a receiver declared by the regulations to be a receiver for the purpose of this Part, but does not include a receiver designed or intended only for the reception of either or both of the following:

(a) radio programs transmitted for reception by the general public;
(b) television programs transmitted for reception by the general public.

Receiver not to be operated without receiver licence

36 (1) A person shall not, without reasonable excuse, operate a receiver except in accordance with a receiver licence.
Penalty: $2000.

Receiver licence

37 (1) Upon application in accordance with the appropriate approved form, the Minister may, in his discretion, grant to the applicant a licence in writing to operate specified receivers or receivers included in a specified class of receivers.

This has about it an inescapable sense of deja-vu.

Over the years, there have been debates, skirmishes and court battles involving the rights of citizens to use certain types of radio receiver.

- The existing Wireless Telegraphy Act requires receivers to be covered by a licence.
- Broadcast and Television legislation concedes the right of citizens to use receivers (currently without payment of a fee) to receive radio and television transmissions originated for reception by the public.
- The Australian Government, along with other National Governments, permits or actually operates broadcast stations in the short-wave bands, thereby appearing to legitimise the use of multi-band radio receivers.
- Even if diffidently, Australian courts have tended to treat as broadcast receivers, receivers which include coverage of broadcast stations.

(For further observations on this, see the article on scanners in our January '83 issue; refer to pages 17-18.)

The proposed new Act, as quoted, exempts from the licence requirement *"a receiver designed or intended ONLY for the reception of . . ."*

Elsewhere, a clause defines the:

Operation of this Act in relation to Broadcasting and Television Act.

(79) Regulations under this Act have effect notwithstanding any instrument relating to broadcasting or television.

That seems to make the intention of the legislators abundantly clear.

Whether all this would modify the view of the courts in any future action remains to be seen. However, on the face of it, dual-wave, triple-wave and general-coverage receivers remain "out on a limb" because they DO cover frequencies other than those used for broadcasting to the general public; they therefore fall foul of that word "only".

The fact of the matter is that it would be tediously difficult and costly to give listeners access ONLY to public short-wave broadcasting stations, having in mind the way they are sprinkled across the short-wave spectrum and the way their schedules and frequencies change for seasonal and other reasons.

IS IT REALISTIC?

For sure, the Minister has the option of issuing licences to cover specified classes of receivers but, remember: on an individual basis, "in writing" and in response to "application in accordance with the appropriate approved form".

I seriously ask: Is it really envisaged that this course will be followed and, if so, at whose expense?

At the bottom end of the receiver-with-extended-coverage market, the cost of issuing the licence may well rival the unit value of the receiver itself.

At the top end of the market, a great many people own valuable communications receivers which they use for personal entertainment, the reception of programs from their homeland, or for "DX-ing" – a worldwide hobby. Illegal in-

Offences relating to sub-standard receivers and transmitters

11 (1) A person who, without reasonable excuse –
(a) except in accordance with a test permit, causes a sub-standard transmitter to make a radio transmission;
(b) supplies a sub-standard transmitter or a sub-standard receiver; or
(c) except in accordance with a test permit, has in his possession a substandard transmitter.

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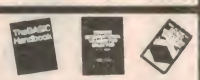

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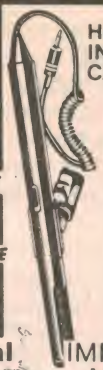

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tention or mischief could not be further from their minds.

Are we still going to have to put up with a law which is morally unnecessary and historically unenforceable, and which requires people to hold a licence for which, historically, no mechanism has ever existed to issue!

How utterly ridiculous! Surely we have reached the situation where it would be more practical to reverse the situation and remove all licence requirements from radio and television receivers — under this Act — except those which the Minister may specify "in his discretion".

He may find reason to specify — and refuse to licence — receivers which give unnecessary and undesirable access to some communication networks and to some satellite distribution systems, which may be set up. At least the issues at stake would be smaller in number, specific in character and better able to be tested on their merits.

I agree that some control may be necessary over the nature of receivers which are allowed to be manufactured, imported or sold to the public in the first place, in the interests of safety, consumer satisfaction and rational use of the spectrum.

For example, receivers could logically and reasonably be banned which:

- Fail to meet electrical safety standards.
- Radiate excessive RF interference.
- Are a potential source of listener complaint by reason of unsuitable design parameters.
- Fail to conform to standards determined for nominated communication services.

And so on.

These and other such controls can be imposed through existing type approval procedures and by new proposed controls over the importation, sale, ownership and use of what the draft Act describes as "sub-standard receivers and transmitters".

My conviction, at this stage, is that the whole business of receiver licensing needs to be re-thought — not from the traditional Departmental viewpoint but from the real life situation with a generous helping of sideways thinking!

When I started out to write this instalment of "Forum", I did so with the general idea of commenting on the proposed legislation as it affected receivers — mainly because it's an area in which we have been involved in the past. But here I am, a couple of thousand words later, still discussing the subject in general terms. It would take a great deal more time and space, and a great many more words to examine the original Act and related legislation, in order to compare it with what is proposed.

And that would mean much more than reading a lot of English prose; it would involve picking one's way through a mass of legalistic parliamentary jargon and being prepared to debate one's findings with others who had a similar concentration of interest.

That task completed, we should have dealt with one small segment of the draft legislation — maybe two or three pages out of fifty or more.

Extend that pro-rata over the rest of the proposed new Act and you start to get some measure of the initial reaction, industry-wide and nation-wide. That has to work its way back to the architects of the legislation and be sorted and sifted for what is legitimate objection or otherwise. Decisions have to be made about essential changes, if any, and what may have to be written into the Act or left within the ambit of administrative "regulations".

To be perfectly frank, the whole exercise of writing this instalment of "Forum" has left me with the disquieting speculation as to how discerning the final debate in the House can be on an Act such as this.

Parliamentarians, required to appear well informed about a hard-to-read Act, drawn up by professional jargon writers, dealing with an unfamiliar subject, at the instigation of public servants, to regulate an industry of which they of which they are not an integral part.

Aw shucks!

The Act has much to say about transmitters, their design and operational requirements and the need to ensure that they do not cause interference with radio communication.

Under "Interpretation", the Bill defines a transmitter as: "(a) anything designed or intended for radio transmission: or (b) any other thing, irrespective of its use or function or the purpose of its design, that is capable of radio transmissions."

In turn (and in part), the definition of radio transmission reads: "(a) any transmission or emission of electromagnetic energy of frequencies less than 3 terahertz . . . without continuous artificial guide."

Does this oblique cross-reference bring under the control of the Bill all man-made sources of interference with radiocommunication? If that is the intention, why not be more deliberate and specific? Or was it an accident of drafting?

Picture by courtesy of Philips

COMPACT disc DIGITAL AUDIO

When you ultimately get to purchase your first compact disc, you will be holding in your hands a radically new audio-hifi product that is less than 10 years old in terms of the basic concept and only about one year old as a product in the world marketplace. In this article, we take a closer look at compact discs and their actual production.

Producing Compact Discs

— a look at what's involved

by Neville Williams

According to Philips, the groundwork for the compact audio disc was laid in the late '60s when that company decided to make "strategic long-term investments in optical electronics".

There were no specific targets — just the conviction that worthwhile commercial developments could emerge from that particular line of research.

Two notable developments did follow: (1) a Digital Optical Recording (DOR) system for archival storage and "office of the future" filing; and (2) the Video Long Play (VLP) laser-read video disc, announced to the world press in August '72 and now active in the marketplace.

During development of the video long play disc, it became evident to Philips that the same basic technology could be used to produce a very high quality, long-playing multi-channel audio disc — a point that was not lost on other major companies which were also working on video discs of one kind and another.

WANTED: A STANDARD

In fact, the technical press began to echo the conviction that, even if it was too late to avoid multiple video disc formats, at least the public should be spared the same hassle with the likely new generation of audio discs.

So, in 1974, Philips made a decision that was no less enterprising than their historic decision to develop and sponsor the compact tape cassette: Philips would develop and sponsor a compact audio disc that would be a distinct, high technology counterpart of the well established LP phono disc — not a somewhat awkward, over-size adaption of a video disc.

To quote Philips: "that year can really be regarded as the first major milestone in the story of the compact disc."

By implication, it would be smaller than a video disc — perhaps small enough for ultimate use in automotive players. It would have a playing time to suit normal audio-hifi requirements and would use a signal encoding system optimised for high quality sound, rather than one dictated by video practices. The disc could also have program information and timing, appropriate to audio, encoded into the signal track.

With the object of winning support, Philips kept other manufacturers informed about their activities and, by April 1979, development had reached a stage where the system could be shown to the press as a proposed world hifi standard.

In August of the same year Philips signed an agreement whereby Sony became a partner company in developing and promoting the compact disc. In June 1980 the two companies presented the proposition to the influential Digital Audio Disc (DAD) Committee but, while the Committee was impressed, the position was still open enough for member companies to exhibit their own competing formats at the October '80 All Japan Audio Fair.

Then, in January '81 the giant Matsushita group (National/Panasonic/Technics) came out in support of the compact disc and this proved to be a vital turning point in its acceptance. Towards the end of last year, about 40 hardware companies had become system licensees, with a dozen or more software companies preparing to meet that need. The list will undoubtedly have grown since then.

PROGRAM SOURCES?

While the physical production of compact discs has posed many problems requiring solution, the provision of appropriate program content is currently presenting difficulties of its own. Basically, this is due to the fact that the CD system is so sonically "transparent" that it reveals to listeners in the home imperfections in the source recordings that have hitherto been much less apparent.

While a whole range of up-graded specifications contribute to this "transparency", probably the single most important subjective difference is the more than 100:1 reduction in system distortion. Sony suggest less than 0.001% for their CD equipment

and more than 1.0% for an LP system — the latter figure assuming a top quality record/cartridge combination, not pushed to its dynamic limits.

Second only to distortion in subjective importance is the dynamic range and signal/noise ratio of the CD system, normally specified at "better than 90dB". In practical terms, this translates into the ability of the system to present tiny, delicate sounds against a background of silence, median level sounds with virtually no noise and no distortion, and high level sounds (including transients) without that subjective sense of "strain" that implies rising distortion and peak clipping.

Without seeking to ignore other short-comings in domestic audio systems, it has become abundantly clear that perceptive hifi listeners using familiar, good quality equipment can readily appreciate improvements of this kind. For the first time, they can "listen through" a mass-produced consumer recording to the contents — and the limitations — of the source recording.

A whole article could be written on those limitations but those currently receiving dishonorable mention include the distortion, noise and transient crushing of analog tape masters, the phase and spatial anomalies of multi-microphone techniques, the distortion and noise problems in mixing, mix-down and effects panels, unduly close or remote microphone placement, multi-generation copies, and so on.

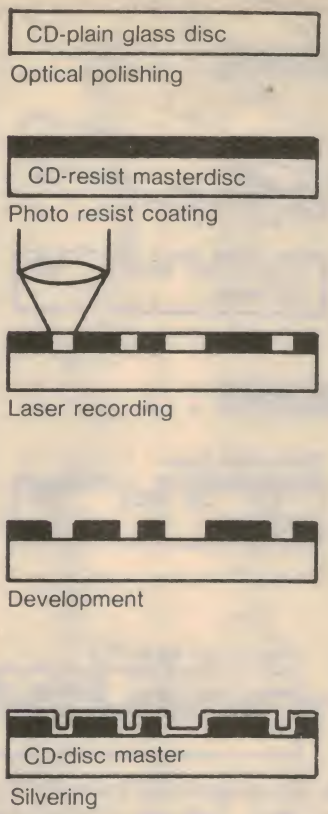
DIGITAL MASTERS

Taken together, these add up to reasons why a very large proportion of the master recordings held in company vaults are not worthy — in terms of quality — of the CD system. Some have already been re-mastered for compact disc, and many more will follow because of consumer demand or other commercial reason. However, such re-issues are fated to be no better than good, by current standards, but disappointing in terms of compact disc expectations.

Fortunately, over the past couple of years, major recording companies have been building up an inventory of new recordings on digital masters and these should be a much better proposition — provided they do not suffer from other technical faults and are attractive in terms of the actual performance.

A description of the actual production of a compact disc is reminiscent of the processes involved in a conventional analog LP disc but, in terms of scale and precision, it is rather like comparing a fine wrist watch with a bargain store alarm clock! In fact, one can carry the analogy further by referring to a quartz-crystal analog watch with its up-dated

MASTERING PROCESS:



Illustrating the five major steps in the production of a compact disc master recording. Steps in the duplication process are illustrated overleaf.

technology and extreme precision.

For a conventional LP recording, the stereo signals are fed into powerful amplifiers, which drive a cutting head on the recording lathe, inscribing the signal — still in analog form — as a continuous groove in the master disc.

For a compact disc, the original signal will ideally have been recorded on a tape master in digital form and then edited and mixed down as necessary by digital means, in order to avoid any build-up of noise and distortion. Philips/Marantz refer to the end result as the "Production Master" . . . "containing the complete audio information, fully edited, equalised and sound balanced".

From the Production Master, a further tape is produced (Philips/Marantz call it the "CD-Tape Master") in which the audio information has been re-encoded and supplemented — or interleaved — with track identification, timing, display codes, etc — a manipulation likely to be understood in detail only by experts in digital information processing.

BASIC PARAMETERS

However, to quote a few raw figures from Sony literature, the basic audio sampling rate is 44.1kHz per channel or 88.2kHz when the stereo channel signals have been interleaved on a left/right/left/right basis. Sixteen data bits are used to describe the size of each sample. After re-encoding and the insertion of data and timing signals, etc, the bit rate on the CD-Tape Master finishes up at just over 6 Megabits/sec, made up of audio channel bits at 4.3218Mb/sec and supplementary data at 2.0338Mb/sec.

This data stream, directly comparable in frequency to what is involved in a video system, is what has to be imposed on the compact disc as a spiral of microscopic pits. And that brings us to the disc itself:

Based on illustrations circulated by Philips/Marantz, the starting point for a CD master recording is a plain glass disc, surface-polished to optical standards and scrupulously clean.

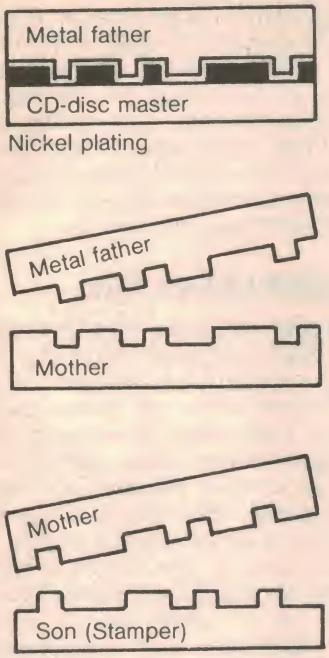
This is coated on one side with a special photo-resistive layer about 0.1μm thick, evenly distributed by spinning. It is analogous to a photo-resistive coating on photographic film.

The sensitised disc is now mounted on a recording turntable and rotated at the precise required speed, while being

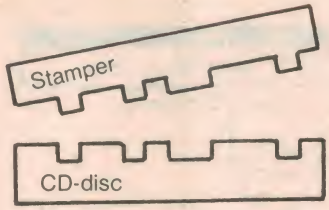
PHYSICAL SPECIFICATIONS:

Disc diameter	120mm
Disc thickness	1.2mm
Centre hole diameter	15mm
Recording diameter limits	46 to 117mm
Signal diameter limits	50 to 116mm
Rotation	Anticlockwise (referred to laser)
Signal path spiral	Inside start
Signal spiral pitch	1.9μm
Lineal scanning speed	1.2 to 1.4m/sec
Playing time (one side)	Nominal 60 mins; max 74 mins
Minimum pit length	0.833μm at 1.2m/sec (min speed)
Minimum pit length	0.972μm at 1.4m/sec (max speed)
Maximum pit length	3.05 to 3.56μm (depends on speed)
Pit depth	Approx 0.11μm
Pit width	Approx 0.5μm

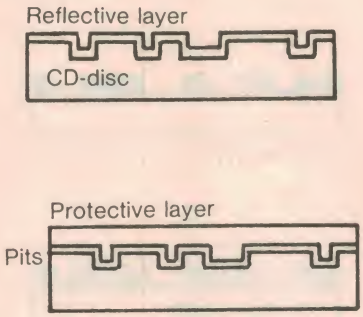
STAMPER MAKING . . .



PRESSING . . .



FINISHING . . .



Also reproduced from Philips/Marantz literature, this diagram illustrates the further steps in producing consumer copies of compact discs. They are strongly reminiscent of the methods used for conventional phono disc production but the level of precision required is far higher.

traversed by a powerful recording type laser. The laser is modulated by the signal from the CD-Master tape so that it writes a pattern of tiny dashes on to the sensitised coating.

This completed, the exposed areas are etched away (or developed) so that the spiral pattern of dashes becomes a pattern of microscopic pits about 0.1μm deep.

This surface is now silvered and then heavily plated with nickel. When this plating is stripped away from the original master, it forms a durable "negative" or "father" disc, with a spiral of microscopic prominences instead of pits. The "father" could actually be used as a stamper to make consumer copies but only for a very limited production run.

Normal procedure is to plate and strip the Father recording to make a number of "mother" discs with, once again, a spiral of pits.

Each of these "mothers" can then be plated to make a number of "stampers" or "sons" which are then used in the presses to produce the consumer discs, using compression or injection moulding techniques, as preferred.

After moulding, the surface carrying the signal information is coated with an extremely thin layer of aluminium to give it a mirror-like surface but with the recorded area having a slightly etched appearance.

To protect this surface and provide the appropriate optical access to the pits for the laser beam, the aluminium is coated with an acrylic plastic or other suitably transparent material, 2μm thick and with a refractive index of 1.5. The information label is normally cemented to the reverse side of the disc.

As explained in the March issue (page 31) the acrylic plastic coating forms part of the optics which focusses the laser beam on to the pits. Moreover, the depth of the pits is held to about one-quarter wavelength of the laser light, so that light striking and returning from the bottom of the pits is one half-wavelength out of phase with that reflected from the adjacent surface. The two cancel so that, to the laser optics, the pits look black. The light is therefore modulated by the stream of passing pits, thereby producing an optical signal equivalent to that which produced the pits in the first place.

It follows that, for the system to operate as intended, the signal surface should be kept as clean as possible. Dust particles and small, inadvertent marks may be counteracted by error-correcting provisions which are part of the CD Disc/player system but the less that this needs to be relied on the better. What CD players will not cope with, to date, are greasy finger marks which are deep enough, in comparison with the 2μm protective coating to de-focus the laser beam.

Passing through the beam at from 3 to 8 times per second, depending on the diameter, a fingerprint-wide interruption to the beam can upset the decoding and produce distortion quite like that which occurs when a normal stylus is skating along a groove, barely touching the sides.

Physically, compact discs must be as warp-free as possible, and with the centre hole as nearly concentric as possible with the pit spiral. The centre hole must also fit the spigot snugly; if too loose, it can sit off-centre; if too tight, it may ride high and cause the disc to rock. Servo systems are provided to cope with disc vagaries but it is better not to rely on them too much, if only because an over-worked servo mechanism may generate noticeable mechanical noise.

A microphotograph of the pits in a typical compact disc recording.

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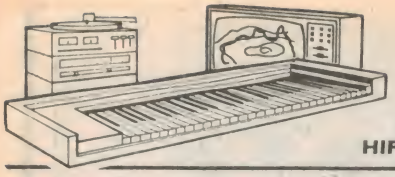


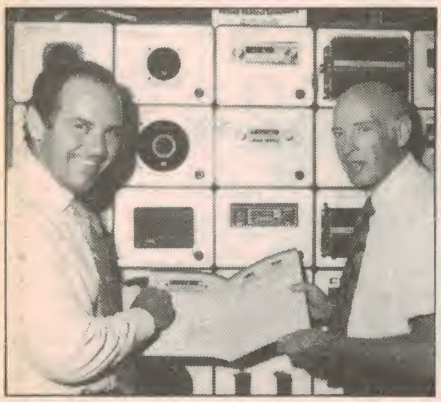
Audio-video Electronics

HIFI • HOME VIDEO • PROFESSIONAL AUDIO

SANYO "NO FUSS" MUSIC SYSTEM

When it comes time to pension off that ageing radiogram, not everyone wants to replace it with an ambitious — and expensive — hifi system. Sanyo have sought to cater for that recurring need with their new DC 45K music system, as illustrated on the right. As an item of furniture, it comprises a woodgrain vinyl cabinet to house the electronics and provide record storage, and two full-height loudspeaker systems which can be positioned to suit the decor. The music system itself combines a sensitive AM/FM-stereo tuner, semi-automatic turntable, cassette deck and an amplifier with full control facilities, with a rated output of 6 watts per channel, plus headphone jack. The suggested retail price is £299.

In brief . . .



A totally new range of **Craig Road Rated Car Stereo** equipment will make its debut on the Australian market later this year, incorporating the latest in electronic technology. It is a versatile range aimed at reducing Dealer inventory.

Announcing the new range in Sydney this week, the President of the Craig Corporation, Mr Peter M. Behrendt (pictured right) said: "The new range, which also features completely new cosmetics, has been designed for multiple use application in today's smaller car dashboards."

"We have designed a series of interchangeable nose pieces for a number of units, making it easy for installation to take place in many different models of cars."

"On the electronic side of the new range, a major new feature will be the Craig Performance Monitoring System (PMS), a sophisticated electronic monitor which will tell the car stereo user about tape and radio performance through a series of visual signals," Mr Behrendt continued.

"These features, plus a sound, exclusive Dealer network backed up by the expertise of the Australian Importer, Sonic International, will see Craig Road Rated Car Stereo equipment become an even better known name on the Australian market in 1983," Mr Behrendt concluded.

Sonic International's General Manager is Martin J. McMurray, pictured (left) with Peter Behrendt. He can be contacted at 4 Clarendon St, Artarmon, NSW 2064. The phone number is (02) 439 8900.

FISHER was, at one time, a well known name on the Australian audio scene, epitomising the American approach to "hifi" of the era. In 1937, Fisher were offering to those who could afford them hifi sound systems featuring beam-powered amplifiers, inverse feedback circuitry, infinite baffle and bass reflex

Home computer, games

The Commodore VIC-20 computer is now being distributed through Video Classics outlets, throughout Australia. Recommended retail price for the basic computer is $299, ready to plug into a power point and connect to the antenna terminal of a normal TV set. Cartridges are available which will convert the VIC-20 to a home video games unit, but that is only the beginning. It can also be expanded into a true home computer with plug-in cassette recorder data storage, extra memory facility, disc drive and a printer. Talk to Gerry Gerlach, at Video Classics Computer Games, 385 Pacific Highway, North Sydney 2060. Phone (02) 438 4866.

Of special interest to broadcasters in the coming Compact Disc era is this F601 Superdynamic Limiter. It is designed for use in the context of 100dB dynamic range and near-zero source noise. (Details from Audio & Design Recording Ltd, 16 North St, Reading RG1 7DA, Berks, UK.

loudspeaker systems and magnetic cartridges. For nearly 40 years they continued to set a lead in technological research and innovation.

But, like many other western hifi companies, the Fisher Corporation was gradually overtaken by the Japanese audio industry and was purchased by Sanyo in 1977. The company now has a 200,000 sq ft facility in Milroy, Pennsylvania where it produces equipment merging American design parameters with Sanyo technology.

Late last year, Fisher brand portable cassette radios were released on to the Australian market through Sanyo Australia and were reported in these columns.

More recently two new Fisher brand VCRs were announced, the FVH-P520 and the FVH-P530, both of them the subject of a review in the current issue of "VideoMag". Both use the VHS format, as manufactured by Sanyo for the US retailing chain of Sears. Under its own brand, Sanyo has traditionally adhered to the Beta format and the Company has indicated positively that it has no intention of changing this policy.

The most recent announcement from Sanyo/Fisher lists the two new VCRs with four different cassette radios, all of them described as "up-market", in keeping with the Fisher image and ranging upwards in price from $350. For information about the Fisher range contact W. Fabiszewski, at Sanyo Aust Pty Ltd, 225 Miller St, North Sydney, NSW 2060. Phone (02) 436 1122.

THE FALK ELECTROSOUND GROUP have announced the appointment of Arthur Muldoon as their National Sales Manager. He will oversee the marketing of their current product range, which includes products carrying such well known brands as NAD, Dual, Boston Acoustics, and SABA TV and Video.

Falk Electrosound are at 28 King St, Rockdale, NSW 2216. Phone (02) 597 1111.

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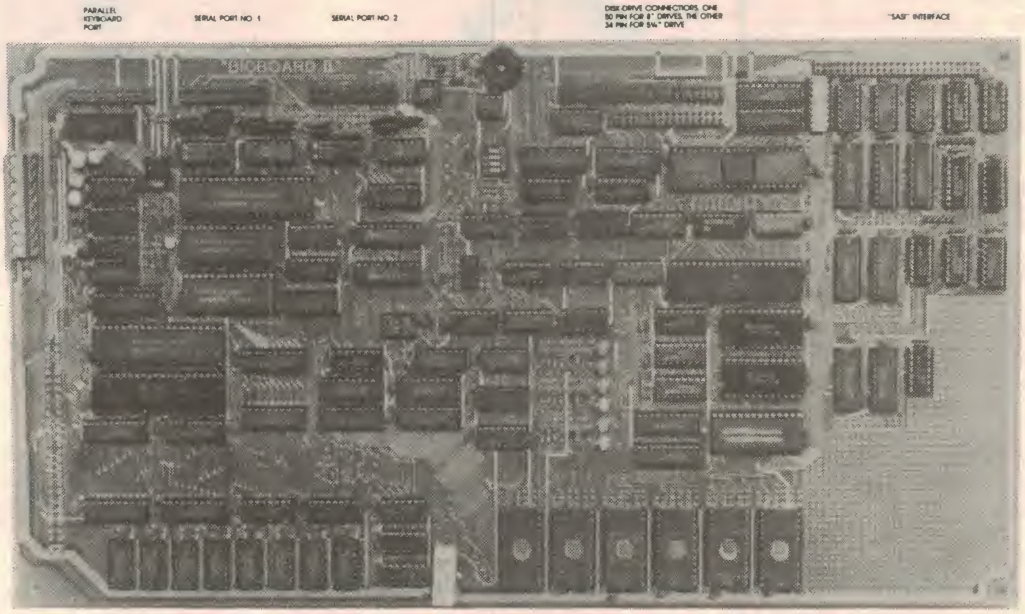
"BIG BOARD II"



EPROMs shown only for clarity.

STD Bus Connector

Prototyping Area

Jim Ferguson, the designer of the "Big Board" distributed by Digital Research: Computers, has produced a stunning new computer that we will begin shipping in November called "Big Board II", it has the following features:

4 MHz Z80 — CPU AND PERIPHERAL CHIPS

The Ferguson computer runs at 4 MHz. Its monitor code is lean, uses Mode 2 interrupts, and makes good use of the Z80-A DMA chip.

64K DYNAMIC RAM + 4K STATIC CRT RAM + 24K E(E)PROM OR STATIC RAM

"Big Board II" has the three memory banks. The first memory bank has eight 4164 RAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732 As, 2Kx8 staticRAMS, or pin-compatible E(E)PROMs. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board, a full kit, or assembled and tested, it comes with a 200 nS2732A EPROM containing the monitor.

MULIPLE-DENSITY CONTROLLER FOR SS/DS FLOPPY DISKS

The new Ferguson single-board computer has a multiple-density disk controller. It can use 1793, 1797, or 8877 controller chips since it generated the signal with TTL parts. The board has two connectors for disk signal with 34 pins for 5.25" drivers, the other with 50 pins 8" drives.

VASTLY IMPROVED CRT DISPLAY

The new Ferguson SBC uses a 6845s CRT controller and 8002 Video Attributed controller to produce a display that will rival the display of quality terminals. Characters are formed by a 5x7 dot matrix on 15.75 KHz monitors and 7x9 dot matrix on 18.60 KHz monitors. The display is user programmable with the default display 24 lines of 80 characters.

STD BUS CONNECTOR

The Ferguson computer brings its bus signals to a convenient place on the PC board where users can solder an DSTD, bus cards can be plugged directly into it, and it can as well be connected by bus cable to industry-standard card cages.

DMA

The new Ferguson computer has a Z80-A DMA chip that will allow byte-wise data transfers at 500K bytes per second and bit serial transfers via the Z80-A S10 at 880K bytes per second with serial processor overhead, though the monitor for the new computer uses the DMA chip mainly for transferring data to and from disk, the chip can readily be used for other things since its "wait/ready" pin can be connected under software control to some half a dozen signal lines. When a hard-disk subsystem is connected to the "Big Board II" via its "SASI" interface, the DMA chip makes breathtaking disk performance possible.

"SASI" INTERFACE FOR WINCHESTER DISKS

The "Big Board II" implements the Host portion of the "Shugart Associates Systems Interface". Adding a Winchester disk drive is no harder than attaching a floppy-disk drive. A user simply 1: Runs a 50-conductor ribbon cable from a header on the board to any of several inexpensive controller cards for Winchester drives that implement the controller portion of the SASI interface. 2: Cables the controller to an appropriate drive, and 3: Provides power for the controller-card and drive. Since our CBIOS contains code for communication with hard-disk, that's all a user has to do to add a Winchester to a system!

A Z80-A S10/0 = TWO ASYNCHRONOUS/SYNCHRONOUS SERIAL PORTS
A PARALLEL KEYBOARD PORT = FOUR OTHER PARALLEL PORTS USER 1/0

The new Ferguson single-board computer has one parallel port for an ASCII keyboard and four others for user-defined 1/0. When the computer is powered-up or reset, the monitor looks for a carriage-return at the keyuboard and serial ports. If the first carriage-return the monitor gets comes from the parallel keyboard, the monitor uses the board's video display circuitry to communicate with the user via a CRT. If the first carriage-return is typed at an ASCII terminal attached to a serial port, the monitor autabauds and makes the terminal the system console.

TWO Z80-A CTCs = EIGHT PROGRAMMABLE COUNTERS/TIMERS

The new Ferguson computer has two Z80-A CTCs. One is used to clock data into and out of the Z80-A S10/0, while the other is for systems and application use.

PROM PROGRAMMING CIRCUITRY AND SOFTWARE

The new Ferguson SBC has circuitry and drivers for programming 2716s, 2732(A)s, or pin-compatible (E)EPROMs. Software $25 extra.

CP/M

CP/M with Russell Smith's CBIOS for the new Ferguson computer is available for $220. The CBIOS is available separately for $65.

Actual board size: 39.6cm x 22.2cm. 5 inch BIOS being developed. Approx price $95.

Pricing and Availability:

Availability: 2 weeks delivery.

In single quantities full kits costs $795.00 + tax, and A&T'd computers cost $950. There are atrractive discounts that range to 35% for OEM's and dealers. For details about them please call Rod Irving on (03) 489 7099. ie: 3 Ferguson II "Big Board" are less 20% off the one-off price, hard disks disk controllers, boxes and power supply to suit both 8" & 5¼" systems will be available.

Errors and omissions excepted.

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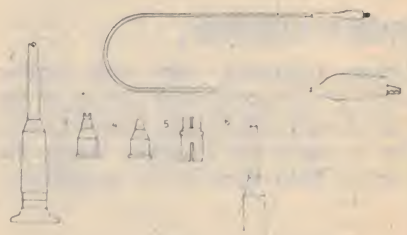

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Hifi Review

Marantz CD-73 Compact Disc Player

One of the first compact disc players to be offered on the Australian market, and the prize in our current EA/Marantz crossword competition, is the Marantz "Model CD-73 Compact Disc Digital Audio Player" pictured here. We take a close look at it from the viewpoint of a hifi enthusiast.

In contrast to many of the prototype CD players we have seen pictured to date, the CD-73 employs slimline styling and has dimensions (with loading drawer closed) of 416(W) x 81(H) x 300(D)mm – and a weight of 8kg. As such, it could readily pass, at first glance, for one of the latest generation of video cassette recorders.

Certainly the styling is similar, although with touches that are characteristic of Marantz presentation. It has a matte gold-finished panel and control pads, black information window, grey/gold body shell and black rear panel. An exception to what is almost the rule, these days, is that the body shell is of metal rather than the ubiquitous high-impact plastic, while the imprint on the back says "Made in Belgium" – an unfamiliar endorsement in this country.

BRIGHT LIGHTS . . .

When operated, the main power switch at the bottom/left corner of the panel literally brings the player to life, with a bright red highlight above the switch, a green glow in the record compartment and a green LED behind the word "Standby" on the record compartment door; behind the information panel, a row of green LEDs marked 1-15 lights up, along with a green/blue stylised industry logo: Compact Disc Digital Audio.

Marantz are certainly fond of their gold and their lights . . . and why not?

Immediately above the power switch is an open/close pad, which operates the disc compartment drawer. Press the pad and the drawer slides smoothly out, with the front lip tilting forward and a disc clamp tilting upwards. In this position, the lens of the laser read-head can be seen pointing upwards through an arc-shaped cut-out, rather like the business end of some ultra-miniature spy camera!

With the drawer open, it is a simple matter indeed to drop the disc over the spigot, label side up. Press the Open/Close button again and the drawer and record slide back into the playing position. It is an elegant system – with just one possible cause for apprehension: if one were careless enough to leave the drawer open, after removing the disc, the upward-facing laser lens could be fouled by dust.

Incidentally, taking the hint from the User Manual, we ascertained that the disc compartment could be opened and closed manually to recover the disc, although the preferred method is obviously to use the motor drive facility.

Mounted more or less centrally on the bottom lip of the disc drawer is a large pad marked: "Next Program – Play". With a disc in position and the deck in standby mode, pressing this pad will initiate normal play, indicated by a red LED behind the word "Laser". Unless otherwide programmed, the deck will play from selection 1 through to the end of the disc, before automatically switching off.

. . . AND SWEET MUSIC

If the "Next Program-Play" pad is pressed again at any time during this cycle, the deck will immediately cease playing the current track and move on to the next selection on the disc or in the program. Indexing is accurate, although somewhat leisurely.

To the left of the "Next Program-Play" pad are pads for "Rev" (Reverse or Review) and "FF" (Fast Forward) enabling the user to sample the disc in either direction. A "Pause" pad just to the right enables play to be interrupted and later resumed at the same spot. A yellow LED indicates that the deck is in Pause mode.

The Marantz CD-73 "could pass for one of the latest generation VCRs."

The display in the information window makes it possible for the user to keep track of the selection on the disc which is being played at any time – a necessary provision in a CD player, because neither the tracks nor the reading head are visible with the disc drawer closed.

As mentioned earlier, when the CD-73 is first switched on, a row of green LEDs numbered 1 to 15 lights up. Within about five seconds of the deck being put into Play mode, it reads off the disc the number of selections to follow and adjusts the display accordingly: eg 1 to 6; 1 to 10; 1 to 14.

At the same time, a small yellow indicator lights up under green LED number 1, indicating that that track is the one being played. As track 1 comes to an end, its LED goes out and the indicator under number 2 lights up. If you don't happen to like track 2, a flick of the "Next Program-Play" pad will bring up track 3 and so on. It's very simple.

In addition to straight-through play, the CD-73 has provision to program play in a number of ways, using the remaining pads ranged in line beneath the information window.

PROGRAMMED PLAY

What Marantz describe as "Random Access Programming" allows the user to nominate up to 15 tracks for play in any order – again a relatively simple procedure: A "Select" pad allows a flashing LED signal (or cursor) to be moved under any track indicator and the choice can be stored in a memory by pressing the "Preset" pad. Having selected the desired tracks, they can be played in the nominated order by simply pressing the "Play" pad.

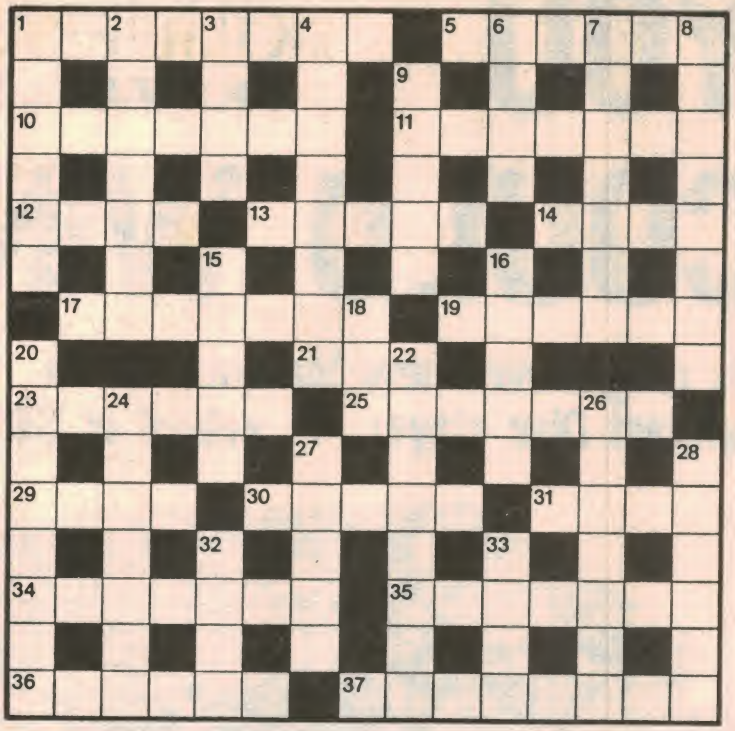
Alternatively, a "Playback Delete" function using the "Select" and "Cancel" pads allows tracks to be deleted from a normal straight-through playback or, for that matter, from a random access program that the user may wish to modify. This can be done beforehand, or during play.

Thirdly, a "Repeat" function is available which can repeat indefinitely straight-through play (with or without deletions), or a random access program or, for that matter, even a single track!

(Curiously, the "Features" list for the model implies that three different random access programs can be stored,

See overleaf

Marantz competition crossword



ACROSS

1. Programmable electronic device. (8)
5. Type of counter. (6)
10. Movement of electrons. (7)
11. Stores information on a tape or disk. (7)
12. Magnetic element. (4)
13. Bidirectional triode thyristor. (5)
14. How electricity can make you turn nuts! (4)
17. Pertaining to discrete electronic pulses. (7)
19. A conducting cell in the body. (6)
21. Type of diode. (3)
23. Wire in mains supply. (6)
25. Slow charge. (7)
29. Vital component in a tape recorder. (4)
30. Term used for radar jamming material. (5)
31. Prefix meaning "all". (4)
34. Speakers in the back seat? (7)
35. Where would you find vast amounts of helium? (2,1,4)
36. Electronic message. (6)
37. Mercury-arc rectifying tube. (8)

DOWN

1. Characterised by recurrence of events. (6)
2. Radio pioneer. (7)
3. Second-hand. (4)
4. Not in circuit. (8)
6. Make a printed circuit board by using a corrosive chemical. (4)
7. Pseudo inductor used in equalisers. (7)
8. Type of circuit used in a tuner. (8)
9. Switch off the current. (5)
15. Soil filter made out of wire mesh. (5)
16. Place where devices are tested flat out! (5)
18. Replay in tennis. (3)
20. Electron emitters. (8)
22. Unwanted shifting of an electronic property. (8)
24. Picture fault in TV. (7)
26. Electronic device which sets a boundary value to a signal. (7)
27. Synchronised signals are said to be in? (5)
28. A millionth of a metre. (6)
32. Kind of charged particle. (4)
33. Type of antenna. (4)

ENTRY FORM **Marantz/Electronics Australia contest**

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Hifi Review — cont.

each involving up to 15 selections. I found no further mention of this in the instructions.)

So much for the front panel control facilities. On the rear panel are RCA sockets for the left and right stereo output channels. The sockets are gold plated, as also are the plugs on the stereo connecting cord supplied with the CD-73.

Below the stereo output sockets are two other RCA sockets intended for a remote control unit – presumably an optional extra.

The only other items on the back panel are a mains input socket, mains voltage selector and a mains fuse.

A notable omission, compared with some other CD players we have seen, is provision for headphone output.

The CD-73 is packaged in the usual way and accompanied by warranty and installation literature, a multi-language user manual, a separate specifications sheet and – surprise, surprise – a circuit diagram. The circuit is simplified to the extent that the ICs and three major boards are shown only as outlines with numbered connections but it is more than what is normally supplied to purchasers!

SPECIFICATIONS

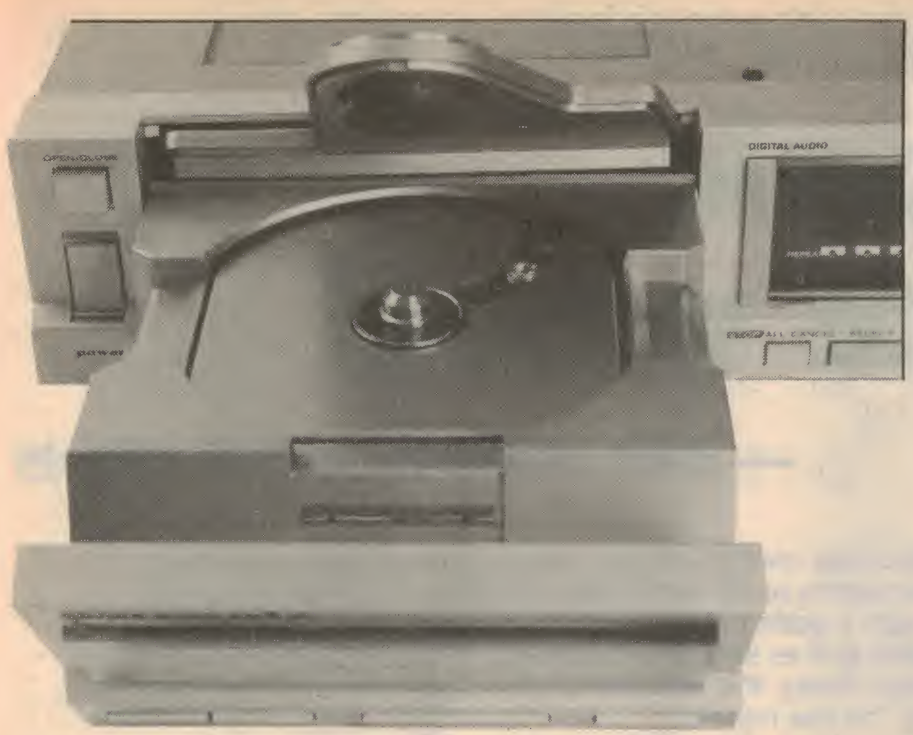
The specifications are as normal for CD players, with a frequency range from 20-20,000Hz; dynamic range, signal/noise ratio and channel separation all better than 90dB; THD less than 0.005%; wow and flutter immeasurable; audio output level 2V RMS; power consumption 40W.

The D/A conversion is specified as 16-bit with digital filtering and the error correction system as CIRC (Cross Interleave Reed Solomon Code).

Because of the continuing scarcity of special test recordings, we were not able to verify these specifications with actual laboratory tests. For that matter, even the supply of discs for ordinary listener observations is still limited. The best we could do was to set up the CD-73 in a typical domestic hifi situation and rely on subjective judgment.

First off, setting up was no problem – far easier, in fact, than one would normally experience with a high performance phono deck. We simply removed the CD-73 from its packaging, removed the two "red" screws that lock the laser head in place during transport, attached the signal leads and mains lead, and we were ready to make music.

Everything about the CD-73 worked as expected – the loading, the play, pause and search functions, as also the skip-track provision. The track indication



The front loading mechanism is not just a power-driven drawer. It houses the platter drive system and the laser pickup head, plus four control pads ranged along the lower edge.

facilities were easy to understand and programming presented no problems.

Marantz have apparently decided that the programming provided in the CD-73 should meet the needs of most hifi enthusiasts – random access to up to 15 tracks or program segments, as already separated on the discs by inter-track "flag" signals. They have not sought to compete with the more ambitious – perhaps over-ambitious – programming detailed last month for the Technics SL-P10.

CLEAN SIGNAL

As to the signal from the CD-73, it was noise-free and at a suitable level for the "Aux" input of the amplifier system.

It was undisturbed when we pulled the favourite demonstration trick of picking up the player and wobbling it around in mid-air.

Tapping fingers on the case produced no audible result but, just a couple of times, we were able to produce a momentary dropout by allowing the plastic disc pack to flop lightly on to the top of the case. (With some CD players, this treatment can cause a much more obvious dropout).

The one thing that never failed to upset the CD-73 – as with all other CD players to our knowledge – is what we have come to refer to in our office as the "brilliantine test": a raised fingerprint left on the signal surface by a finger that has been passed through someone's oily locks! It can upset the decoding to the point where it sounds remarkably like a conventional phono stylus which has gathered to itself a large ball of fluff.

(Perhaps we should add that such fingerprints can be easily removed, without visible or audible trace, by wiping the disc with a soft, well-washed linen handkerchief.)

One other point we noticed had to do with a disc which was just slightly tight on the player spigot. One could see it running visibly out of true and, while the CD-73 tracked it (miraculously, we felt) one could hear the hum from the servo mechanism as it followed the undulation.

Could this be a reason for some of the arguments we've heard at CD demonstrations? "I could hear the record spinning!" "No you couldn't ... it's perfectly quiet!"

But, such problems aside, we heard enough from the Marantz CD-73 to know that it was capable of very clean sound, very high separation, startling transients, and delicate, fragile sounds out of silence. I guess what we are really waiting for is the time when all those characteristics are brought together, predictably, on discs that we can buy over the counter, carrying the music that we like best.

That much is up to the software manufacturers.

The CD-73 is being marketed through selected Marantz dealers, Australia wide, at a suggested retail price of $999. The head office of Marantz (Aust) Pty Ltd is at 19 Chard St, Brookvale, NSW 2100. Phone (02) 939 1900. (W.N.W.)

Gamble away to your heart's content

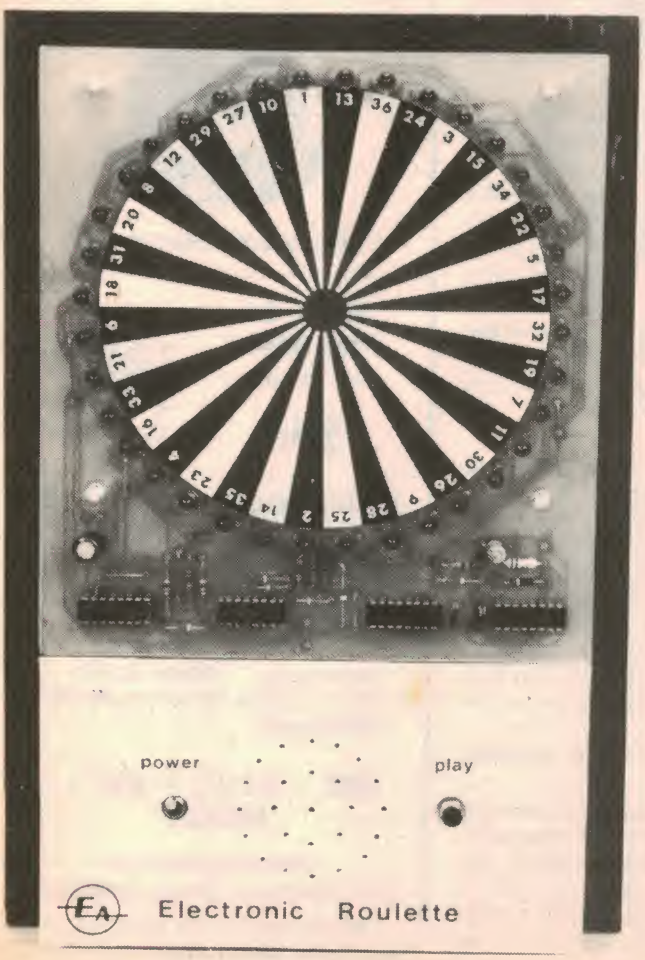
Electronic roulette wheel

— with realistic sound effects

Centrepiece to the glamorous casinos of Las Vegas, Monte Carlo and Wrest Point, the roulette wheel seems to be particularly effective in separating people from their money. Although it does not represent particularly good value for the gambler, people are drawn to it as sailors to the sirens. If you've always wanted to try your hand but don't fancy the element of risk, build the EA Electronic Roulette wheel and play "on the house".

by COLIN DAWSON

This electronic roulette wheel has 36 LEDs arranged in a circle. These function as a chaser so that the light appears to rotate. Although both the ball and the wheel rotate in a real roulette wheel, it is clearly not practical for us to rotate the wheel – we must settle for the ball. When the play button is depressed, the ball rotates at about 240 RPM and gradually slows when the button is released. This simulates the inertia of a real roulette wheel with the "cliffhanger" finishes.



Another touch of realism is provided by integral sound effects. This consists of a clicker which represents the ball bouncing from one number to the next.

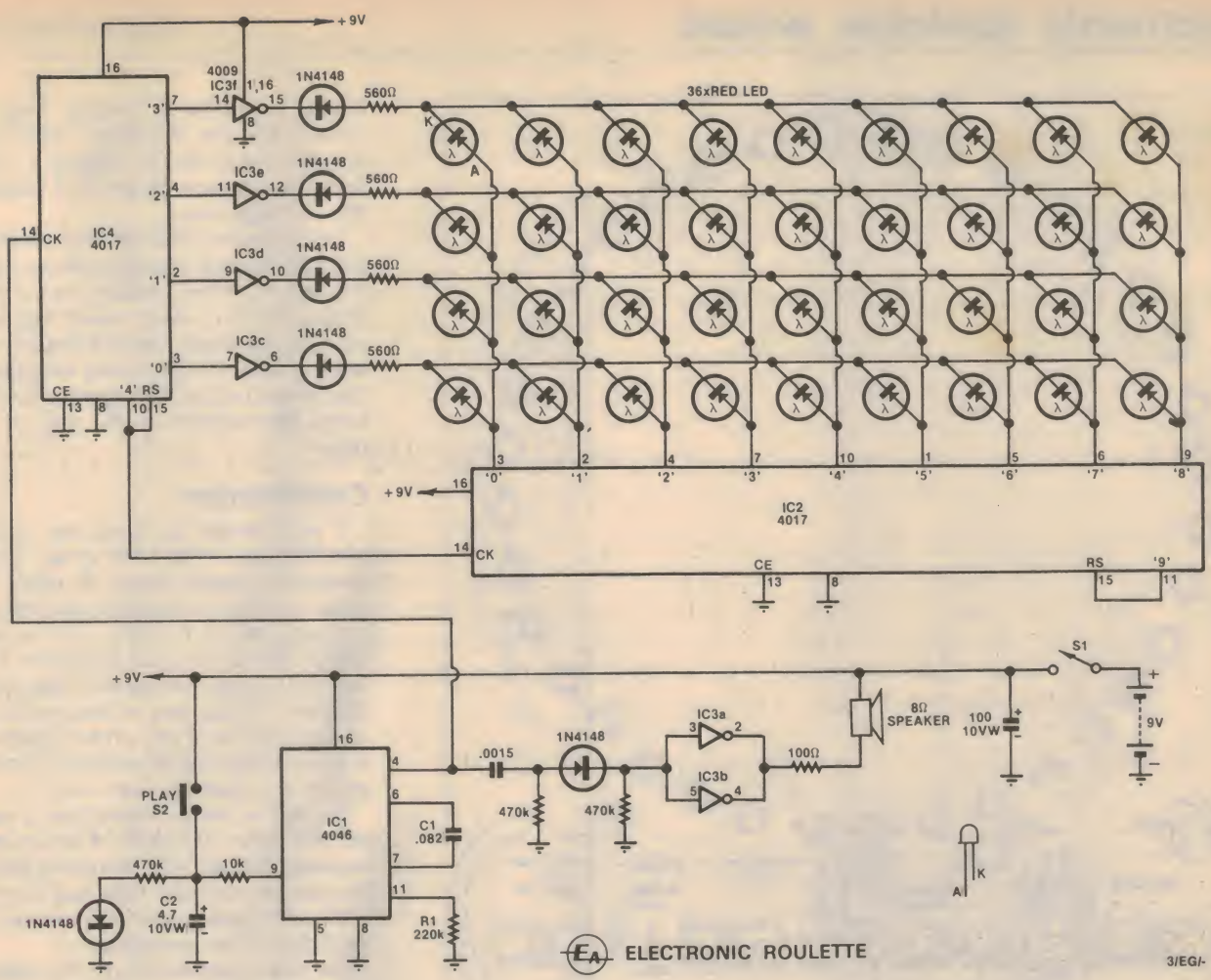
Actually we presented an electronic roulette wheel about six years ago. This was a mains powered and rather expensive project, whereas the latest version has been designed for the budget minded gambler. It requires only a 9V battery for power.

In operation the wheel appears to be completely random – we were not able to detect any bias and the chances of selecting a winning number are one in 36. Actually, this compares favourably with casinos which have either a 1 in 37 or 1 in 38 chance of selecting the winning number. This is due to the inclusion of a "0" (Europe) and "00" (US) on the wheel. Since the payout is fixed at 35:1 for a single (or "straight up") bet, the house has an advantage – particularly in the US casinos.

The LEDs are driven by a clock and counter arrangement. Whilst this may sound simple enough, there are some interesting refinements. The clock, for example, must vary in speed to simulate the inertia of the wheel. The counter – rather than employing 36 separate outputs – has a much more economical 9 x 4 arrangement which is used to drive the LEDs in a matrix.

Perhaps surprisingly, the design of this project owes more to the "Selectalott" Lotto selector than the original roulette wheel. It shares the concept of driving the LEDs by means of a matrix although originally a 6 x 7 matrix was used rather than the 9 x 4. (A 6 × 6 arrangement could have been used in place of 9 × 4, but the 9 × 4 combination made for an easier layout, and saved a few minor components.)

In the interest of minimising the expense, we have not built the "wheel" into an enclosure. All the components, except the battery and speaker, are mounted on the printed circuit board (PCB). This was subsequently mounted on a piece of Masonite, although constructors may well choose an alternative mounting system.



How it works

All the counting and LED driving functions are performed by four CMOS ICs. This contributes to the low power consumption – around 5mA to be specific.

Clock pulses are provided by IC1, a 4046 phase locked loop. Although this IC is capable of a number of functions, we have utilised only its voltage controlled oscillator (VCO). By varying a reference voltage on its input (pin 9) the output frequency can be controlled over a large range. The maximum speed is determined by C1 and R1 and in this case is about 180Hz.

At this speed it is just possible to tell where the "ball" is at any given time during rotation. Admittedly, this can encourage a certain type of player to indulge in sleight-of-hand techniques (ie, attempt to release the play switch at the same point each time). Apparently some people are such bad sports at gambling that they actually expect to win. However, they will be disappointed with the EA roulette wheel, since it would require super-human reflexes to achieve this.

The output of the VCO (pin 4) is connected to the clock input (pin 14) of IC4, a 4017 decade counter. Normally, each of the 10 outputs, labelled "0" to "9" goes high for one clock cycle. Only one output can be high at any given time and after the "9" count the IC resets to "0" and the process repeats. By connecting any output to the reset pin (15) the device can be reset before it reaches the "9" count and in fact we have configured it to reset at "4".

The count cycle is effectively "0", "1", "2" "3" and reset. The "4" output is high for such a short time before reset occurs that there is no apparent delay between the "3" and "0" counts. However, the "4" output is connected to the clock input of IC2 (the other 4017) and the brief pulse is sufficient to clock IC2. Normally, the carry out (pin 12) would be used for this function. This goes high at reset and stays high until the "4" count. It is apparent that with a reset at "4", the carry out will never go high and therefore can not be used in this circuit.

The "9" output of IC2 is connected to its reset so that it is effectively an 0 to 8 counter. Hence IC4 counts 0 to 3 and then clocks IC2. After nine cycles of IC4 (or 36 clock pulses) IC2 will have completed its cycle. In this way, the 36 different outputs are obtained.

Each of the outputs of IC2 drives 4 LED anodes. These four LEDs will have con-

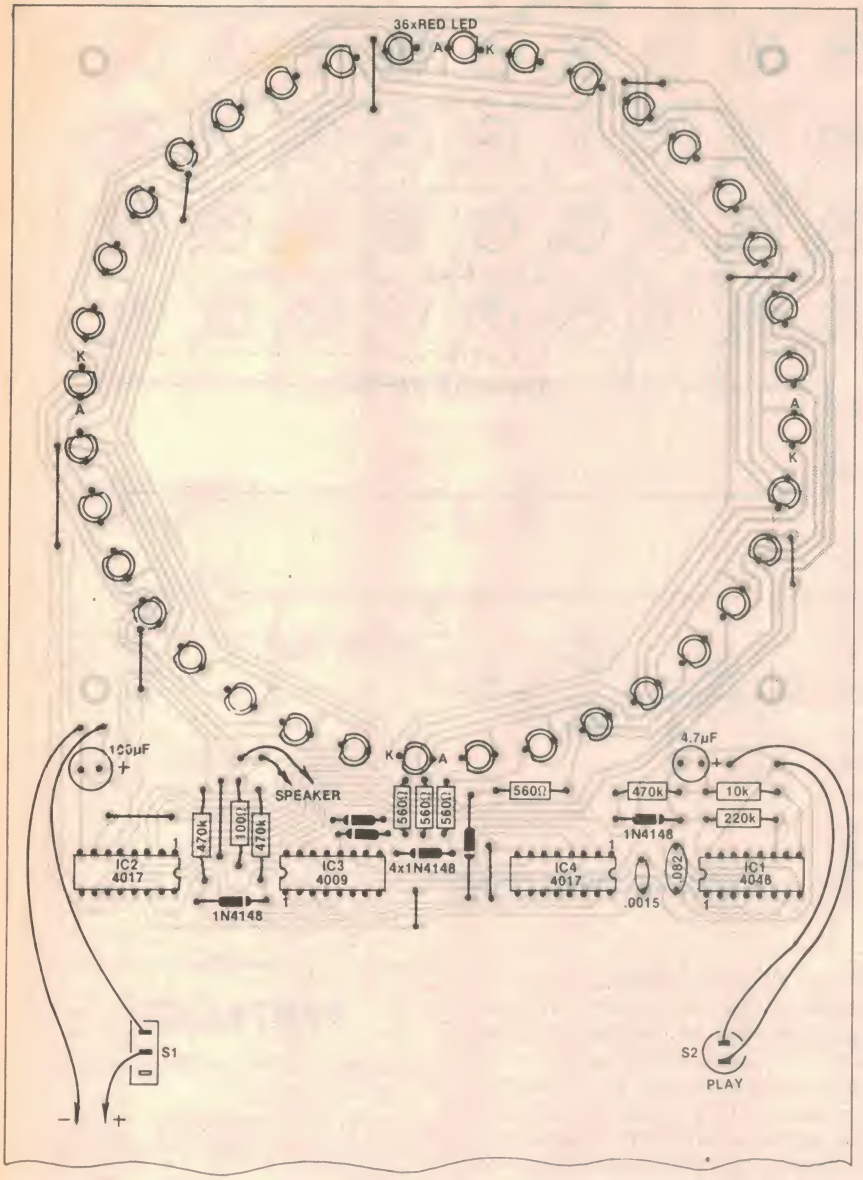
PARTS LIST

1 printed circuit board, code 83eg5, 250 × 160mm
4 nylon PCB stand offs
1 Single pole, single throw (SPST) switch
1 SPST momentary contact switch
1 8Ω miniature loudspeaker
1 9V battery, Eveready 216 or equivalent
1 battery clip to suit

SEMICONDUCTORS
2 4017 CMOS decade counters
1 4009 CMOS hex inverting buffer
1 4046 CMOS phase locked loop
6 1N4148 diodes
36 LEDs

CAPACITORS
1 100μF/10VW electrolytic
1 4.7μF/10VW electrolytic
1 .082μF greencap (metallised polyester)
1 .0015μF greencap

RESISTORS
3 x 470kΩ, 1 x 220kΩ, 1 x 10kΩ, 4 x 560Ω, 1 x 100Ω.



Note that three of the wire links are mounted on the underside of the board.

secutive positions on the wheel and each will come on in turn as IC2 cycles through its 0-3 count. Since we want a LED to be on when the two IC outputs corresponding to its position are high, it is necessary to invert the output of one of the ICs. In fact IC4 drives each of its LED strings through IC3 – a 4009 hex inverting buffer. A 560Ω current limiting resistor is also included in each string, as is a diode which prevents reverse biasing of the LEDs when they are turned off.

Since IC3 is a hex buffer package, there are two "spare" buffers and these are put to good use driving the loudspeaker. Although they buffer the output of IC1, it is not simply a matter of connecting their inputs (pins 3 and 5) to IC1. This would result in two clicks per clock cycle-one on the positive edge and one on the negative edge. Since the counters only advance on the positive edge, this would be unsatisfactory.

The .0015µF capacitor, 470kΩ resistor and diode feeding the two buffer inputs allow only one click per clock cycle – on the positive edge. This occurs simultaneously with the ball moving to successive positions. Connecting the two buffers in parallel may seem a little unusual. But this has been done to increase the current drive to the loudspeaker. The 100Ω resistor limits the speaker current to a safe value for the buffers.

When the "Play" button is depressed, C2 immediately charges to the supply voltage and takes the VCO input (pin 9) high in doing so. While ever the button is held down, the VCO operates at its maximum frequency of about 180Hz. When the button is released, the capacitor begins to discharge through the 47kΩ resistor and the associated diode. After about 15 seconds the capacitor voltage falls below the minimum VCO value and the oscillator stops.

The purpose of the diode in series with the 47kΩ resistor is to give the rotation of the wheel a more realistic inertia effect. Without it, the LEDs would appear to stop too suddenly over the last few positions. The diode effectively modifies the discharge curve of the capacitor and prolongs the rotation at the end of each play.

Construction

If you decide to build the roulette wheel along similar lines to ours (the "El Cheapo" version!) there is really little more to construction than mounting the components on the PCB. This is coded 83eg5 and in our case measures 250 × 160mm. As you can see from the overlay diagram, a large part of the board does not actually have any printed design on it and could easily be omitted if you can mount the switches elsewhere.

The PCB in our roulette wheel is retained with nylon standoffs. If these are to be used, drill the PCB mounting holes to the correct size (the hole size is critical with nylon stand offs). Mark out and drill the holes in the baseplate.

The first components to be installed are the links. There are 10 of these in all, with three mounted on the foil side of the board. It is most important that the appropriate links be installed underneath the board, otherwise they will interfere with the wheel artwork.

Having obtained a photocopy of the roulette wheel artwork, cut it to size and glue it in place. Be particularly careful that the "wheel" is centralised. In this respect, the glued paper should prove much easier to handle than Scotchcal. If you are using the full size PCB (with control panel) the rest of the artwork could also be used.

There are two traps to watch for when mounting the LEDs – the polarity of each LED, and the position of the first LED, ie, making sure that it is fitted to a genuine "pair" of holes, rather than a false "pair", made up of one hole from each of two adjacent pairs. Both problems are taken

We estimate that the current cost of components for the project is approximately

$24

This includes sales tax.

HOW TO PLAY ROULETTE

Roulette is played with a roulette wheel, chips and a betting table. Bets are made by placing chips on the specially marked table. The wheel is then used to select a winning number at random. A normal wheel, as used at a casino, has 36 numbers, and one or two zeros. The zeros are to provide a bias in favour of the casino. Our Electronic Roulette Wheel does not have any zeros.

At least two players are required, one of whom becomes the banker. Players bet against the banker, but cannot bet amongst themselves. Each player should be supplied with an equal number of chips. If possible, each player should have different coloured chips, to avoid confusion when many bets are laid on the table.

The banker should be supplied with larger numbers of chips of all colours, to lessen the chance of "breaking the bank". Chips can be improvised from buttons, coloured counters or similar objects.

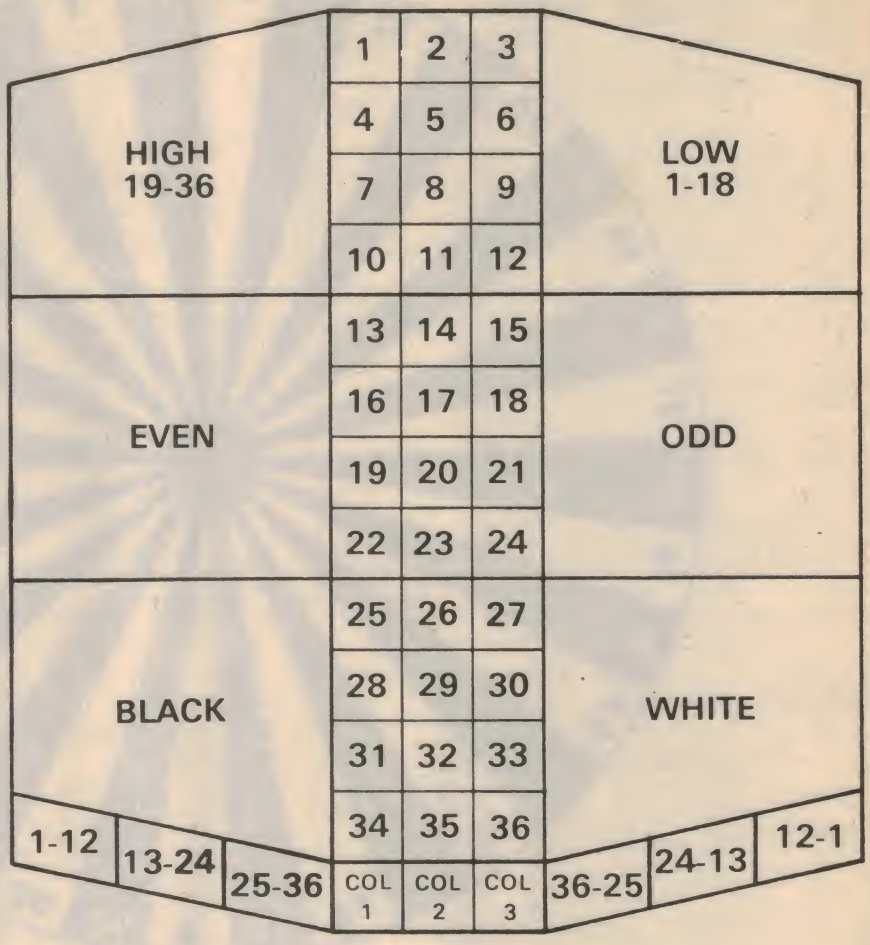
A large copy of the table layouts should be made, marked with the numbers as shown. This can be as large as desired. A foolscap size table is suitable for up to six players. The various types of bets, how they are made, and the odds they pay are explained below.

Experienced gamblers may have noticed that we have used a black and white table instead of the more usual black and red one. This was because we found it easier to fabricate a black and white front panel for our Electronic Roulette Wheel. However, there is no reason why a constructor with suitable facilities could not make a red and black panel, as is usually used in casinos. Alternatively, it would be possible to paint or otherwise colour the white sections red. In any case, the table layout should match the front panel of the wheel.

There are six ways of wagering on an even chance. One can bet that the next number will be black or white, even or odd, or high or low. This is done by placing a chip (or chips) on the relevant areas of the table. You may bet on more than one occurrence (eg, black and odd), and more than one player can bet on the same occurrence.

All these wagers pay even money, ie, if you wager one chip on the black, and a black number comes up, you receive your original stake back, as well as an extra chip (your winnings). If a white number comes up, you lose your stake.

Odds of 2 to 1 are paid on bets in the nine boxes at the bottom of the table. The centre three boxes represent all the numbers in the columns directly above them. The boxes on either side represent the numbers



This diagram should be enlarged and copied onto cardboard. The final size will depend on the number of players and the size of the chips to be used.

marked in them. Bets are made by placing chips in the appropriate box. A winning bet is tripled, the winner receiving his original wager plus twice as much.

To receive odds of 35 to 1, you may bet on any single number, by placing your chips in the appropriate box. Odds of 17 to 1 are obtained by betting on two numbers. These numbers must be next to one another on the table, and the bet is made by placing your chips on the dividing line between the two numbers. You win if either number comes up.

To bet on three numbers at once, and receive odds of 11 to 1, place your chips on either side wall of any row. Thus to bet on 13, 14 and 15, place your chips either on the right hand wall of box 15, or the left hand wall of box 13. You will win if either 13, 14 or 15 comes up.

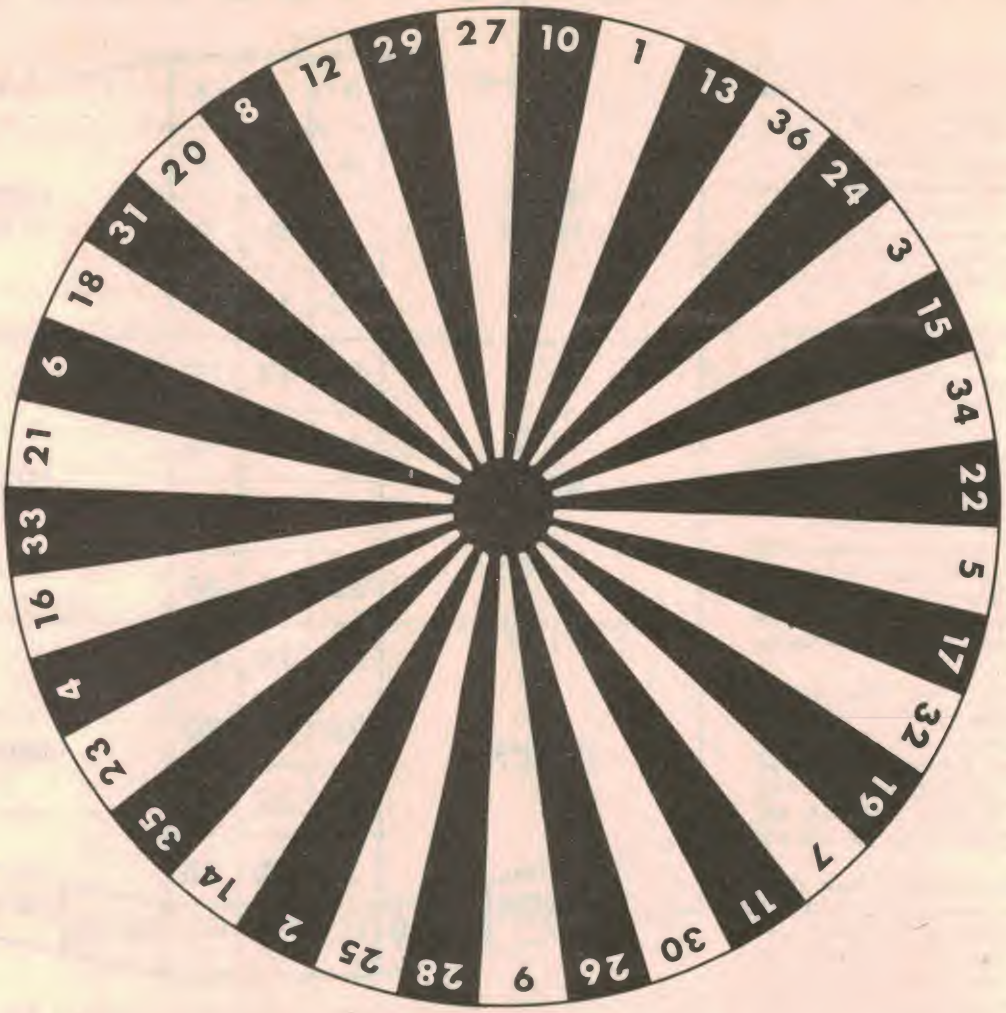
Odds of 8 to 1 are obtained by betting on four numbers at once. This is done by placing your chips on the common corner of four numbers. It is not possible to bet on four numbers which are not adjacent. By placing your chips on the side walls so that they cover two rows, you receive odds of 5 to 1, and win if any of the numbers in either of the rows comes up.

These are the only bets which can be made. A player may make as many bets at one time as he desires, and as many players as wish can bet on any one number or combination of numbers. When all bets have been laid, the banker calls "no more bets", and spins the wheel.

When the wheel stops spinning, the banker calls the winning number, eg, "ten on the black", and then removes all losing wagers from the table. He then pays out all the winning bets to those fortunate few. No more bets should be laid on the table until all winning bets have been paid. This will avoid confusion, and prevent unscrupulous players from making bets after the result has been decided.

The game can then continue, until either all the players or the banker goes broke.

Electronic roulette wheel



Photostat this page and use the design above on the front panel of the roulette wheel. Be certain that the design is centred on the panel. If the control panel is incorporated use the additional label shown below.

power +

play +

EA **Electronic Roulette**

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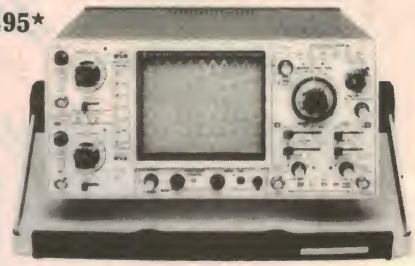

For applications requiring the highest degree of measurement sophistication, TRIO offers the new 100MHz CS-2100A. A second generation design with a new level of performance and reliability. It brings ultra-high performance standards and a vast array of features into one efficient package. This new scope represents the state-of-the-art and features a rugged industrial construction. As a result, the CS-2100A is efficient, light-weight and highly reliable.

- 100MHz response and 3.5ns rise time
- 120MHz response at −6dB
- 500μV/Division cascade sensitivity
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- Four-input operation provides trigger views or four separate inputs
- Selectable 1MΩ or 50Ω inputs
- Alternate timebase operation
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See Review This Issue of EA.

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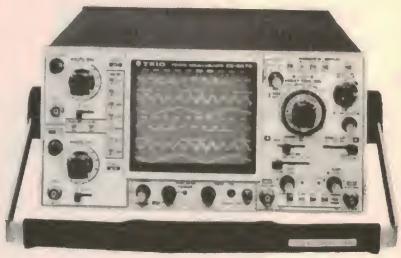

The new TRIO Model CS-2070 is a cost-effective full-feature portable lab scope. Having many of the important capabilities of the CS-2100A, the CS-2070 comes more feature-packed than most other scopes in its bandwidth class — and it offers higher performance.

- 1mV/division sensitivity to 70MHz
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- Four-input operation provides trigger view on four separate inputs
- Alternate time base operation
- 20MHz bandwidth limiter
- Lighted function pushbuttons

A Favourite of Leading Computer Companies! 35MHz, 2mV Sensitivity

$995*

The CS-1577A should be your choice for microprocessor system development and troubleshooting . . . Broadcast studio applications . . . Monitoring RF waveforms . . . Monitoring digital data transmission . . . Logic and digital design work . . . Measuring propagation delays and phase shifts . . . Troubleshooting and maintaining video systems . . . Comparing amplifier input-output waveforms and displaying algebraic difference as a distortion curve.

- 35MHz response; usable beyond 50MHz
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- 2mV/cm vertical sensitivity
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- 1024 byte memory
- 1μs write time
- Conventional 10MHz oscilloscope mode
- Immediate display of stored waveform
- Can capture waveform prior to trigger signal
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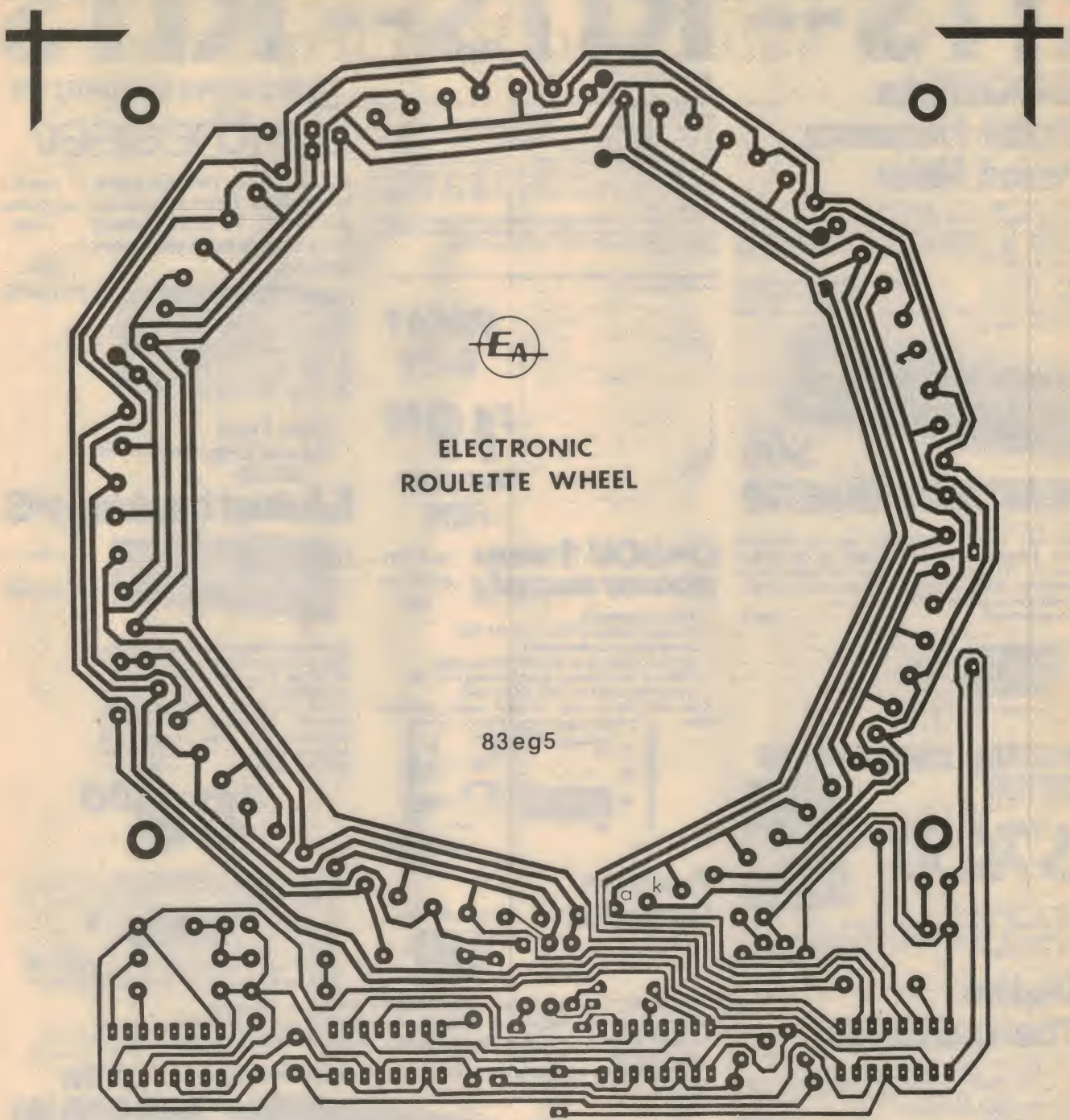

The full-size PCB pattern for the upper section of the board. A 90mm section below the pattern carries the switches.

care of together; we have etched an "a" and "k" in the copper pattern to indicate the position and polarity of the first LED to be mounted. Once this one is correctly fitted, the remainder will fall into place naturally. (The longer of the two LED leads is the anode, and the flat on the plastic encapsulation is adjacent to the cathode.)

The rest of the components can now be mounted on the PCB. The ICs are all CMOS devices, so take the usual precautions. Wire up the switches, speaker and battery and let 'er roll!

KITS-- KITS-- KITS--

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Jaycar has by far the best kit version of this project in Australia. We now supply 2 x GOLD plated BNC input connectors at no extra cost!
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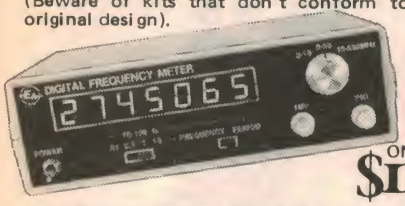

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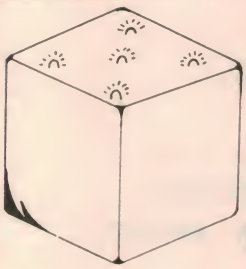
MAGIDICE

The best electronic dice ever made! Firstly, this is not a kit. It is completely built and tested.
Basically the MAGIDICE is a glistening black cube measuring 75mm on all sides. It has 6 LED's set into the top of the cube under a red filter (the filter LOOKS black as well).
When the switch in the base is turned on, a wave of the hand over the top of the cube causes the circuit to operate. The cube beeps and gives you a guaranteed random dice "throw" in the form of illuminated LED's. There are no buttons to press and you don't even have to touch the cube!
The last number will remain until you note or wave your hand over the unit to "throw" another number. This (patented) product makes an absolutely unique gift and comes attractively presented.
Cat. XC-2006

Please note that a 9V battery snap (supplied) must be fitted to use on local 9V standard cell.



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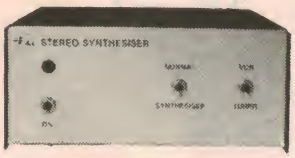

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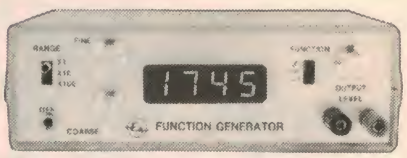

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Signal to Noise 102dB with respect to 1 Volt
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Boost/Cut: 14dB (28dB total)
Distortion 100Hz 0.002%, 1kHz 0.003%, 10kHz 0.008%, (essentially irrespective of cut or boost)
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- TUNER INPUT
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- TAPE INPUTS (2 OFF)
- INPUT LEVEL CONTROL
- TAPE OUTPUTS (2 OFF)
- 400Hz CALIBRATION OSCILLATOR
- LED AVERAGE (VU) & PEAK
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KITS-- KITS-- KITS--

LOW COST DIGITAL MULTIMETER KIT

BY POPULAR DEMAND

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Ref: EA March 1983 (This month)
Almost everyday we are asked for a multimeter kit. Up until now we thought that it was just not worth it considering the fine low-cost built-up units available. The DP2010 changed all that.
This kit, fully imported from the UK, uses the famous DPM-05 custom LCD/Voltmeter to achieve phenomenal accuracy at very modest cost!
All parts are included to complete the meter including an attractive and colourful front panel. (a 9V battery is required)

Set of test probes to suit $2.95
Probe to suit Cat. WT5312 ONLY $2.50
Eveready 216 (red) 9V Battery Cat. SB2370 ONLY $1.40

DP2010 kit Cat. KJ7010
ONLY $45

AC VOLTAGE AND CURRENT RANGES
When S3e selects a.c. functions the output from either the voltage attenuator or current shunts is fed through C1 to remove any d.c. component.

SPECIFICATIONS

Function	f.s.d.	Resolution	Accuracy	Protection
Volts (d.c.)	2V	1mV	1%±1 digit	500V for
	20V	10mV	1%±1 digit	one minute
	200V	100mV	1%±1 digit	
	500V	1V	1%±1 digit	
Current (d.c.)	2mA	1uA	1%±1 digit	1A/250V
	20mA	10uA	1%±1 digit	
	200mA	100uA	3%±1 digit	
	2000mA	1mA	5%±1 digit	
Volts (a.c.)	2V	1mV	2%±5 digit	500V for
	20V	10mV	2%±5 digit	one minute
	200V	100mV	2%±5 digit	
	500V	1V	2%±5 digit	
Current (a.c.)	2mA	1uA	2%±5 digit	1A/250V
	20mA	10uA	2%±5 digit	
	200mA	100uA	4%±5 digit	
	2000mA	1mA	7%±5 digit	
Resistance	2K	1	1%±1 digit	260V
	20K	10	1%±1 digit	r.m.s.
	200K	100	1%±1 digit	
	2000K	1K	1%±1 digit	
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Highly efficient design uses switchmode technique

50V/5A laboratory power supply: Pt.1

This is the first of two articles describing a new and very efficient variable power supply using the switchmode principle. The new power supply can deliver voltages anywhere in the range from three to 50 volts DC and at voltage settings of 35V or less, it can deliver currents up to five amps. It is easily the most powerful DC supply we have ever described, with a maximum power output of 175 watts!

by JEFF SKEEN

Not only is this new power supply the most powerful we have ever produced, it is also the most efficient, and for its rating, the most compact. In fact, if we had not had the benefits of the switchmode principle, the supply would be a great deal more bulky and expensive. At the lower voltage settings the supply would have had to dissipate powers in excess of 150 watts. To do that, you need very large heatsinks which would probably have to be fan-cooled.

Most computers these days use switchmode power supplies as these are a practical and efficient method of providing a highly regulated supply with high current output.

This month's article will be devoted to the principles of switchmode power supplies while next month's will contain the full constructional details of the new supply.

Basic principles

To gain an understanding of the operating principles involved in a switchmode power supply we will start our circuit explanation with the simplified diagram shown in Fig. 1.

In this circuit transistor Q1 is an ideal switch with "on" and "off" (or open and closed) times controlled by a pulse width modulator (PWM) circuit attached to the base. By ideal we mean that Q1 has no voltage drop between emitter and collector when conducting.

When Q1 is on (base voltage is low) current I1 is drawn from Vcc, passes through Q1 and L1 and supplies both the load, RL, and charges the output capacitor, CO. The voltage at the cathode of the diode, D1, is the same as Vcc so the diode is reverse biased and non-conducting.

While Q1 is on, energy from the current I1 passing through L1 is stored in the magnetic field developed by the coil. When the signal on the base of Q1 goes high, Q1 turns off and ceases to pass current. The energy stored in the magnetic field must now be dissipated and this energy is delivered to the circuit as current, I2, which is driven by the voltage induced across L1 by the collapsing field.

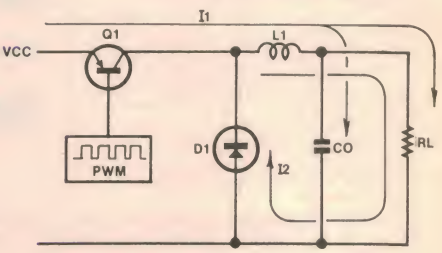
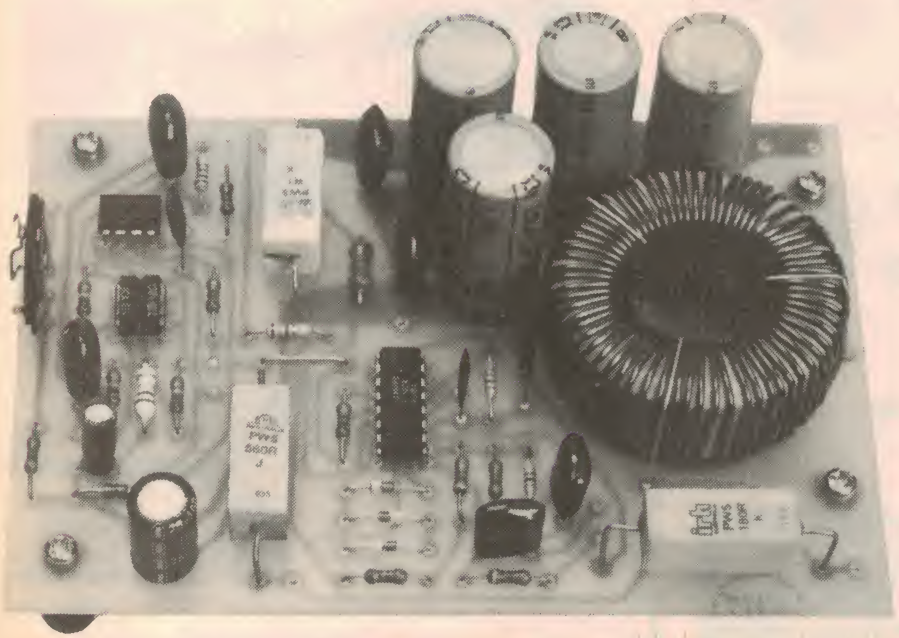


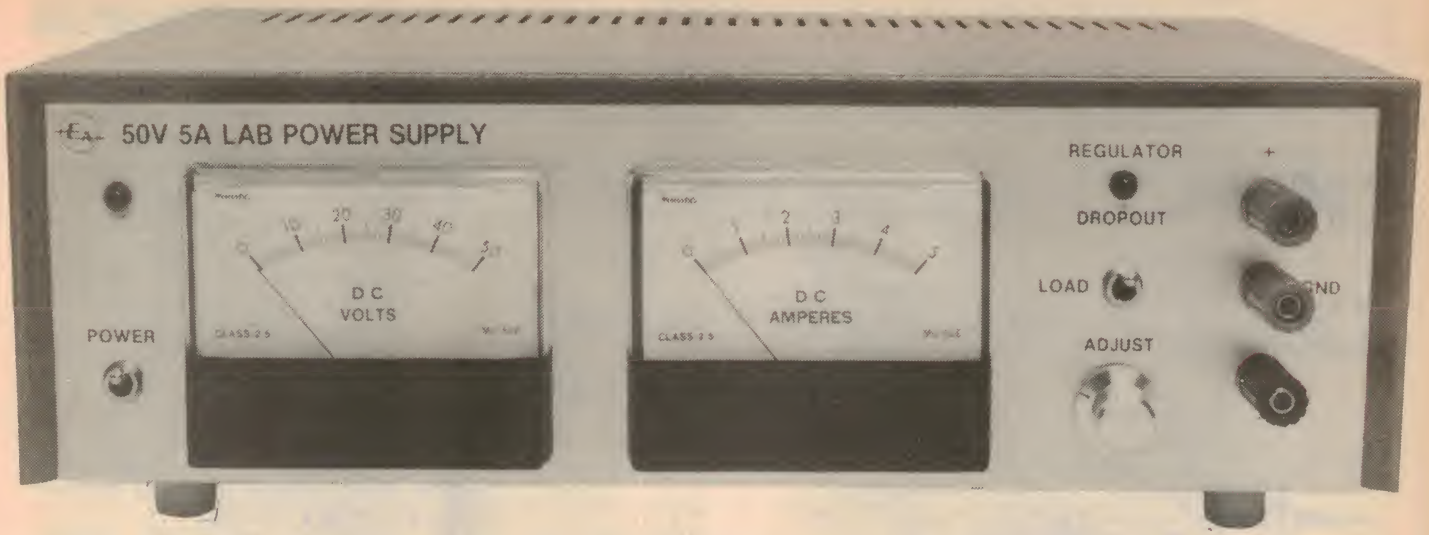
Fig. 1

The induced current I2 flows from the coil, through the load, through D1 (which is now forward-biased) and back to the coil. In addition, CO begins to discharge, also supplying current to the load.

When the PWM signal at the base of Q1 goes low again, Q1 will turn on and pass current (I1) once more. D1 will again be reverse-biased and non-conducting, and current from Q1 will pass through L1, recharging CO and powering the load. This current will also rebuild the magnetic field around L1, preparing it for the next Q1 off-cycle.

The inductor L1 together with the capacitor CO forms a filter which


Close-up view of the control PCB assembly for the new power supply. Note that the final version differs slightly from this early prototype.



Our new switchmode supply has adjustable voltage output from 3 to 50V and a maximum 5A output at voltages below 35V.

averages out the waveform from the collector of Q1 to give a DC voltage across RL. The magnitude of this voltage is given by the equation,

$$V_{out} = Vcc \times t_{on}/T$$

where t_{on} is the period when Q1 is conducting and T is the total period of the waveform applied to the base of Q1.

For an ideal power supply, this output voltage is independent of the output current. This is another way of saying that the power supply has zero output impedance.

From the above formula we can see that any factors which would tend to cause changes in the output voltage can be compensated for by adjusting the on-time (or duty cycle) of Q1. To do this we need a control circuit which can modulate the pulse width of the signal applied to the base of Q1 while monitoring the output voltage for any changes. This is then referred to as "pulse width modulation".

The reason for the high efficiency of the switchmode regulator is that the pass transistor, which is the principal source of losses, is operated at its two most efficient points. At cutoff, there is a large voltage across the transistor but little current through it. Conversely, at saturation there is little voltage across the transistor but a large current through it.

Either way, very little power is dissipated in the switching transistor so efficiency is high. And heatsinks can either be small or, in some cases, dispensed with entirely.

Basic PWM circuit

Now refer to Fig. 2 which illustrates the basic components of a PWM circuit and how they function together. There is an RC oscillator which produces a sawtooth output, an error amplifier which monitors the output voltage and a comparator which actually produces the square wave pulse train which is fed to the base of switching transistor Q.

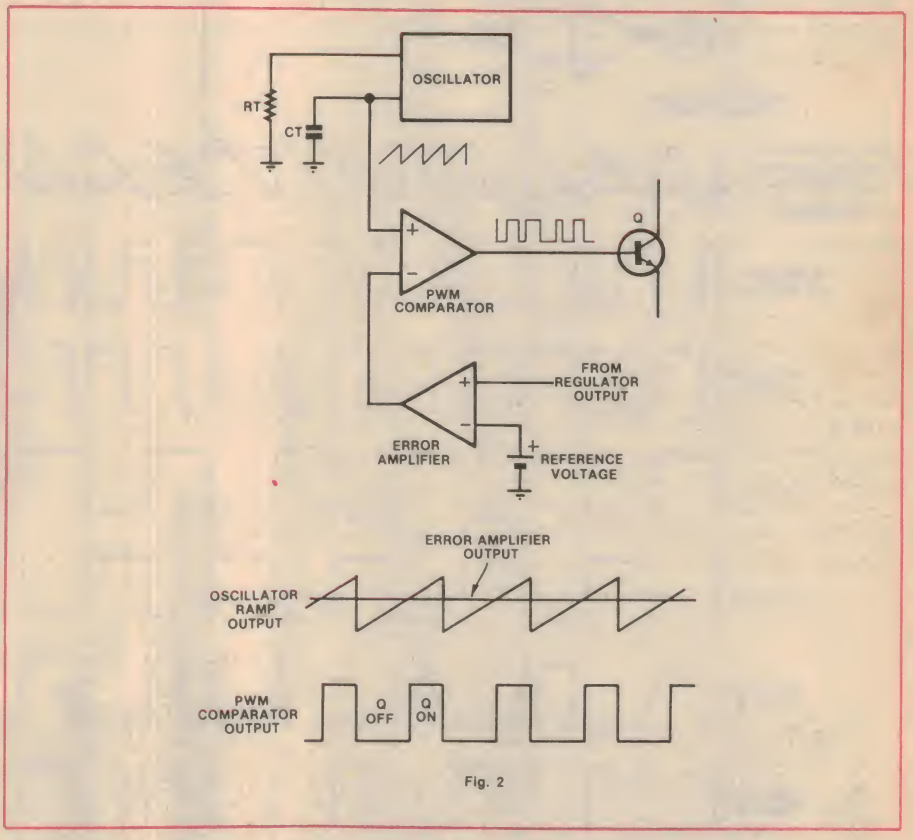


Fig. 2

OK. Now the RC oscillator produces a sawtooth waveform with its period defined by RT and CT. Not that surprising really, is it? In our power supply, the operating frequency is just beyond the limit of audibility, at around 20kHz. But the actual frequency is not important.

The error amplifier performs the same function as the error amplifier in any linear regulator circuit. It compares a proportion of the power supply output voltage against a very stable reference voltage. The output of the error amplifier is then essentially a constant voltage on which is superimposed an amplified version of the small fluctuations in the power supply output. In other words, as far as we are concerned, the output of the error amplifier is essentially a constant DC voltage.

This voltage from the error amplifier is compared to the sawtooth voltage from the oscillator by the PWM comparator. When the sawtooth voltage is the higher, the PWM comparator will have a high output and Q will be turned on. When the error amplifier voltage is the higher the PWM comparator output is low and Q is turned off.

By looking at the timing diagram which is part of Fig. 2, this operation can be fur-

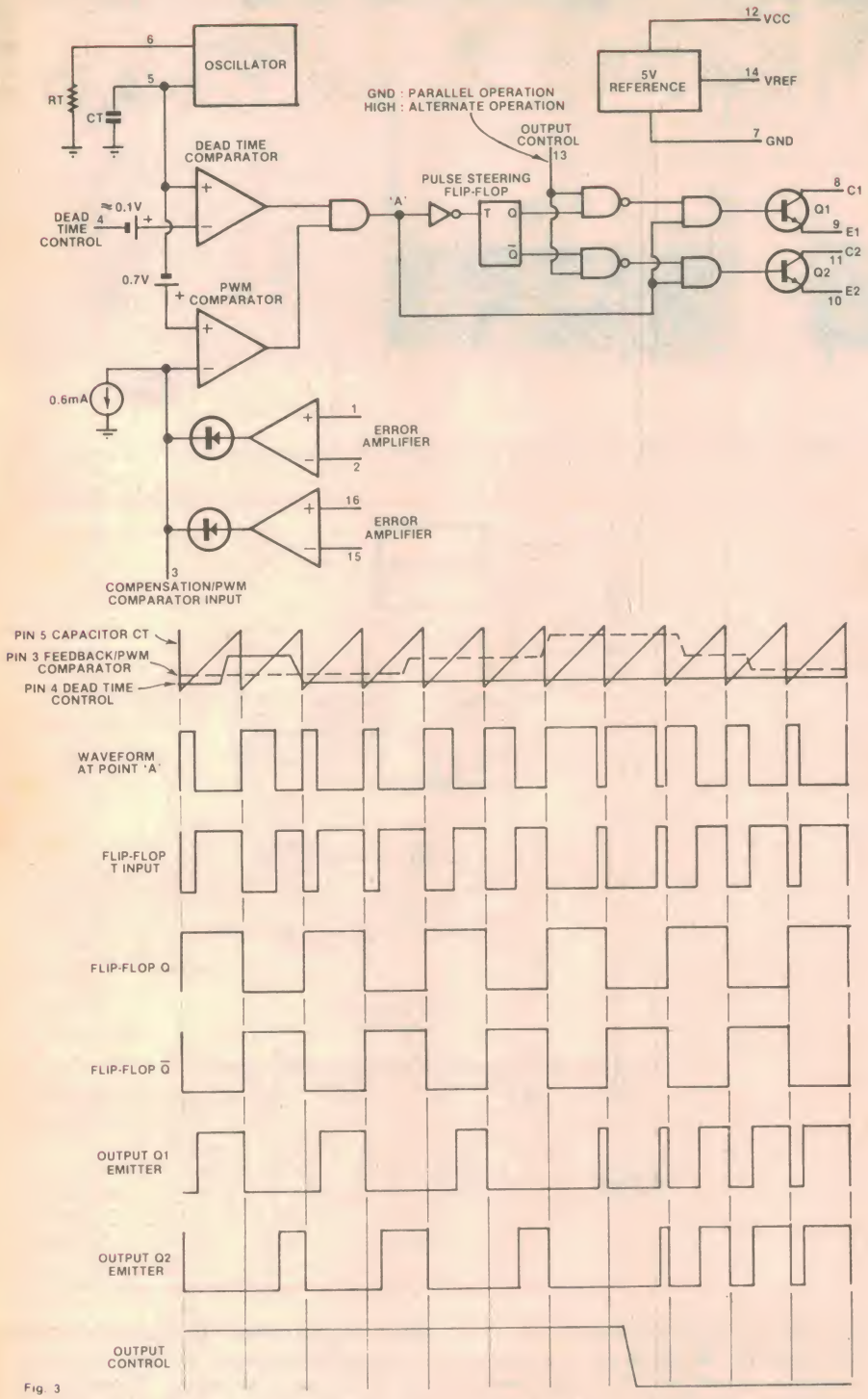


Fig. 3

ther elucidated. Note that if the error amplifier output was higher than shown in the timing diagram, the intersection times of the two waveforms would be shorter and hence the pulses from the comparator output would be correspondingly shorter (although still having the same repetition rate, ie, 20kHz).

By the same process, if the error amplifier output was lower, the intersection times of the two waveforms would be longer and the comparator's output pulses would also be longer.

Well, that essentially describes how a pulse-width modulation circuit works. Such a circuit could employ a number of discrete semiconductors at the simplest level, or in the most refined versions use a specially designed IC. Such an IC is the Fairchild μA494 switchmode regulator which is the heart of our new power supply.

Fig. 3 is a full block and timing diagram for the internal circuit of the μA494. It differs from the simplified diagram in several ways. Firstly, components for an extra mode of operation have been added so that the μA494 may be used in push-pull or bridge type circuits with transformer coupled outputs. These components include an extra transistor, logic circuitry and an extra comparator (called the dead time comparator).

Secondly, instead of one there are two error amplifiers provided. One error amplifier is used for output voltage control in the same manner as in the simplified diagram of Fig. 2 while the other error amplifier is usually used to provide current limiting.

To do this the voltage drop across a small resistor in series with the load is measured. If the voltage drop exceeds a preset value (indicating excessive current) then the output of the error amplifier rises and reduces the output transistor on time so that the output current is kept to a safe level.

Logic circuitry

The logic circuitry is arranged so that the mode of operation of the output transistors can be selected by the appropriate voltage level applied to the output control, pin 13. A high level on the output control and the output transistors turn on and off alternately in sympathy with the flipflop outputs. A low level (or ground) applied to the output control causes both output transistors to operate in parallel and ignore the flipflop outputs.

With the output control grounded, the state of the output transistors at any time is dependent upon the output state of the dead time and PWM comparators. Both comparators high and the output transistors are on, either or both comparators low and the output transistors are off.

The inputs to the comparators differ from the simplified diagram in that there are DC offset voltages applied. To gain an understanding of the operation of the comparators assume firstly that the dead time control (pin 4) is connected to ground. The 0.1V offset which is now applied to the inverting (–) terminal of the dead time comparator means that for the comparator output to go high, the voltage (ramp) across CT must be greater than 0.1V.

Since CT is discharged below this voltage at the beginning of each ramp, there will always be a short interval at the beginning of each cycle when the output of the comparator is low and hence the output transistors are off. This is called "dead time" and is required to preclude the possibility of both output transistors being on together when con-

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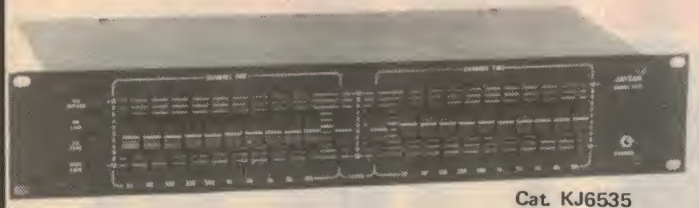

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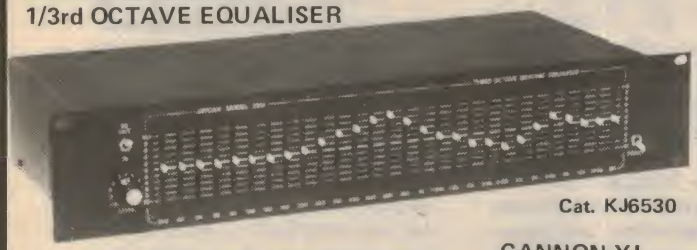

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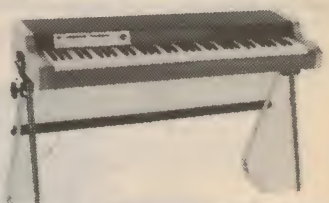

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nected in the push-pull mode.

Due to storage effects in the bases of the switching transistors, it will take a short while for them to respond to the controlling signal applied to their bases and turn off. If sufficient time is not allowed between their on cycles, the transistors may form a short circuit across the power supply with potentially disastrous results.

The PWM comparator is designed to compare the ramp voltage across CT plus a 0.7V offset, against the voltage present on pin 3, the compensation/ PWM comparator input. Most of the time the voltage present at pin 3 will be held low by the 0.6mA current sink and so the non-inverting input will have the higher voltage on it. This will cause the PWM comparator to have a high output most of the time.

If either error amplifier detects an error then the voltage at the inverting (–) input of the PWM comparator will rise since the error amplifiers can supply enough current to swamp the 0.6mA current sink. The PWM comparator output will remain low, and hence the output transistors will remain off, until the voltage at the non-inverting (+) input of the PWM comparator rises above the voltage at the inverting input.

This is shown by the dotted voltage level in the first line of the timing diagram.

The outputs of the error amplifiers are connected to pin 3 via diodes which form an OR gate and isolate one error amplifier output from the other. In this way error amplifier outputs may swing high or low independently of each other.

If required, the voltage of pin 3 may be raised with an offset to reduce the duty cycle of the output pulses in the same manner as the 0.1V offset on the dead time control. This feature may be used to provide a "soft start" facility on a power supply to minimise current transients upon turn on.

The last section of circuit to be covered is the 5V voltage reference. This generally forms the reference against which the power supply output voltage is compared. It can also be used as a supply voltage for external circuits and will provide up to 20mA of current in this mode.

Next month we shall present the full constructional details of the new power supply together with performance specifications.

Fairchild μA494: basic data

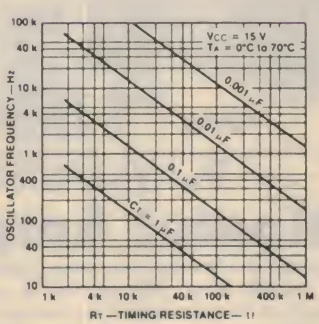


Fig. 4: oscillator frequency vs timing resistance.

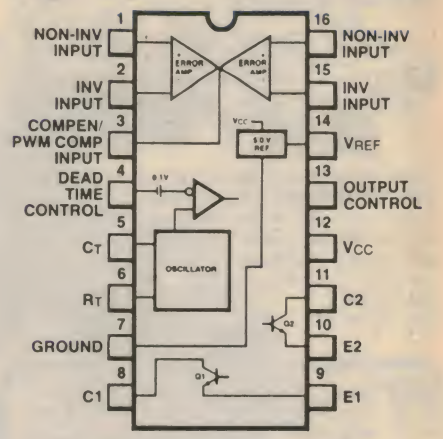
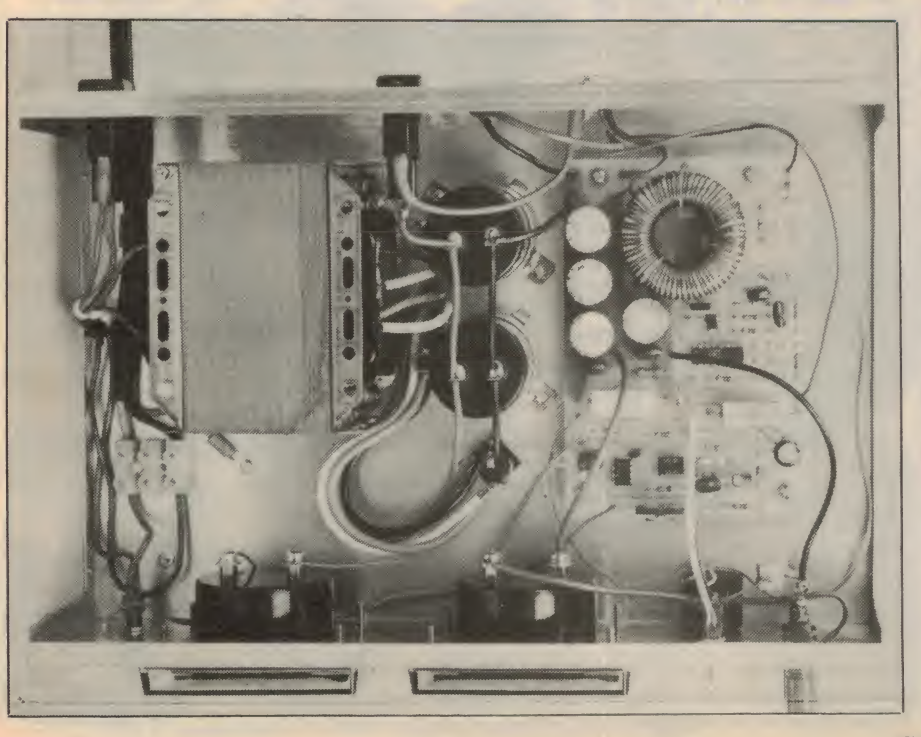


Fig. 5: connection diagram for the μA494 PWM control circuit.

NOTE: Figs. 4 & 5 and the accompanying table reproduced from the Fairchild linear data book, courtesy Fairchild Australia.

Recommended Operating Conditions

Symbol	Characteristic	μA494C Min	μA494C Max	Unit
V_{CC}	Power Supply Voltage	7.0	40	V
V_{IN}	Voltage on Any Pin Except Pins 8 and 11 (Referenced to Ground)	−0.3	V_{CC} +0.3	V
V_{C1}, V_{C2}	Output Voltage	−0.3	40	V
I_{C1}, I_{C2}	Output Collector Current		200	mA
C_T	Timing Capacitor	470	10	pF μF
R_T	Timing Resistor	1.8	500	kΩ
f_{osc}	Oscillator Frequency	1.0	300	kHz
T_A	Operating Ambient Temperature Range	0	+70	°C



◀ *LEFT: here is a sneak preview inside the prototype. Full constructional details will be published next month.*

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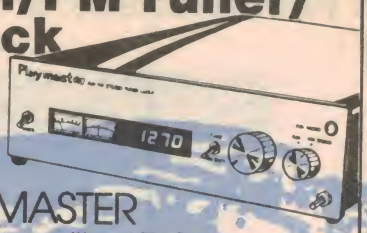

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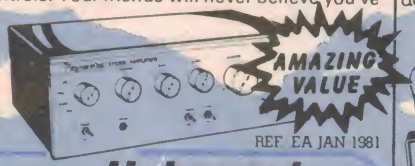

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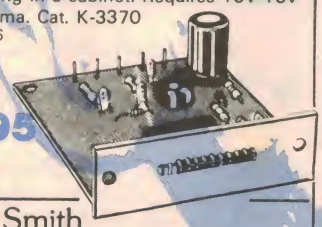

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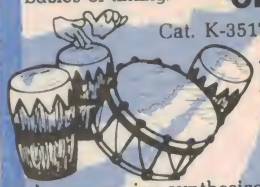
REF. EA SEP 1982

Percussion Synthesizer

Now you've got rhythm – with this Percussion Synthesizer. Produces the sound of drums, cymbals, snares and bongos. You can play manually or by total electronic control. Add a sequencer, and you can have automatic rhythm just right for learning the basics of timing.

Only **$47.50**
Cat. K-3517
REF. ETI MARCH 1982



Percussion Sequencer

Single PCB kit enables the percussion synthesizer (above) to be controlled externally by this rhythm generator and it does it automatically! You could start your own band! Also useful for taping and dubbing.
Cat. K-3518

Only **$12.50**
REF. ETI JUNE 1982

The Dick Smith
Crystal Set

- No batteries
- Great sound
- Foolproof circuitry

Want a crystal set that works during blackouts and doesn't need batteries. Then this is just for you! Dick's own crystal set kit. A satisfying project that will give you lots of fun. It can pull in a suprising number of broadcast stations. You can even connect it to your stereo system.
Cat. K-2650 REF. EA APRIL 1982

$7.95

AMAZING VALUE

EARPHONES *CHOOSE OPTIONAL HEARING DEVICE*

Crystal – high impedance earpiece with 3.5mm plug. Budget priced!
Cat. C-2765 **$1.75**

Magnetic – high impedance Ideal for your crystal set. As used by spies everywhere.
Cat. C-4000 **$7.95**

BUILD YOUR OWN ELECTRONIC GAME!

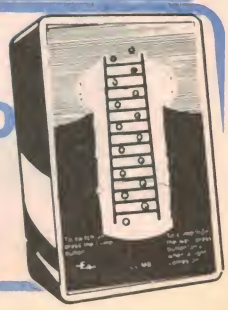
LEDS & LADDERS

This has to be one of our most popular novelty kits. A game of skill which is not only a lot of fun to play, but which also gives you a chance to improve your reflexes. Can you climb out of the well without getting dumped back in? Easy to construct, the kit comes with all parts required and full instructions. Also included is a specially printed foil label for the box. A great kit to build.

Only **$16.50**

100'S SOLD!

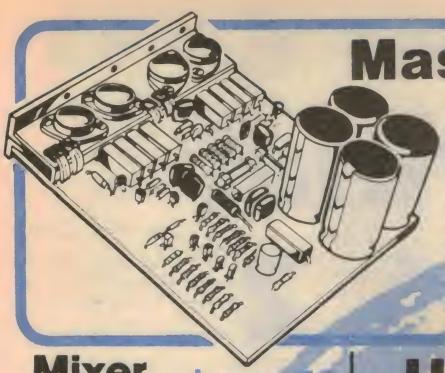
REF. EA JULY 1980
Cat. K-3390



DSE/A480/2/JW

Massive Music Power

300 Watts RMS Amplifier



The fantasic amplifier kit gives you tremendous scope for boosting the output of your existing sound system – use one module to produce 300 WATTS RMS into 4 ohms or two units to give a truly massive 600 WATTS RMS continuous power. This is the ideal unit for public address, rock groups etc. or whenever high power is required. Kit comes complete with all components and instructions. (Not including transformer and heatsink). Cat. K-3444

Only **$72**

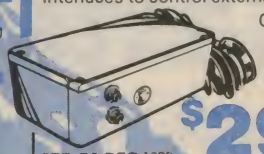
REF ETI FEB 1980

Activate home lights from your car!

DRIVEWAY SENTRY

Turns home lights etc.on for a predetermined time – activated by headlights. Self-contained watertight diecast box – has internal relay that interfaces to control external functions.

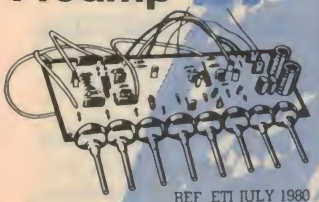
Cat. K-3305



Only **$29.50**

REF EA DEC 1982

Mixer Preamp $29.50



REF ETI JULY 1980

Designed to suit the 300W amp kit, this mixer preamp has 4 inputs with an impedance of 100K – suitable for most microphones, guitars etc. Ideal also for use with 50W (K-3440) and 100W (K-3442) power amp modules. This unit provides bass, treble and presence control.

Instructions supplied. Cat. K-3035

Not supplied with transformer, case or power wiring.

Universal Inverter

100's of uses for this fantastic inverter just by re-arranging the coil winding as explained in the instructions supplied. Any voltage available up to 1400V.

Cat. K-3276

ONLY **$49.50**

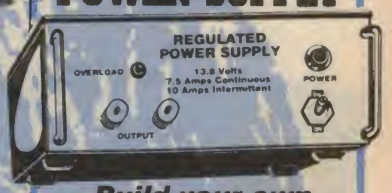
Two Channel Infrared Remote Control

An inexpensive 2 channel remote control with a range of 20m and will control 2 appliances independently. Use it to control your alarms, stereo, radio, in fact just about anything you can think of! The transmitter is battery powered and enclosed in a small 'Zippy' box whilst the receiver is mains powered and housed in a handsome metal instrument case.

(undrilled)

Cat. K-3380 ~~WAS $69.55~~ **$59**

HIGH POWER SUPPLY



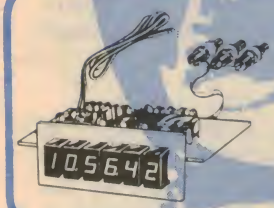
Build your own power supplies!

Here's a power supply that's just the thing for operating transceivers, RF power amps or anything that requires 13.8V DC (nominal) supply and pulls more amps than the general run of 'CB' type power supplies can deliver. Huge 7.5 amp continuous rating and 10 amp peak. Comes complete with Aluminum Instrument Case. Cat. K-3452

REF ETI JULY 1982

ONLY **$79.50**

12V Car Clock



6 DIGITS – HAS SECONDS!

This extremely easy-to-build clock kit ideal for cars, boats, aircraft, etc. Bright red LED digital readout, large 8mm high, and chronometer accuracy, quartz crystal controlled, this is the only clock kit with seconds display. This kit operates from any 9-19V DC source; use a simple power supply or plug pack for 240V DC operation. Highly detailed instructions included.

Cat. K-3495

Power supply to suit (Cat. M-9514)

ONLY **$19.75**

REF EA JUNE 1979

LCD Panel Meter

An incredibly versatile and highly accurate panel meter with a highly visible LCD display with HUGE 15mm digits. Uses the famous 'intersil' chip (as used in a huge number of professional test circuits), and its low cost makes it an extremely attractive and viable replacement for conventional analog equipment. The display is removable from the rest of the PCB for remote or angled placement. Full Scale: 200mV; Resolution: 100uV: Power Supply: 5-15V DC.

Cat K-3450 **ONLY $29.50**

Video Modulator Kit

An RF modulator kit that uses just one transistor! This unit is enclosed in a small tinplate box to minimise radiation and all components are mounted on a small PCB. Cat. K-3462 **$4.75**

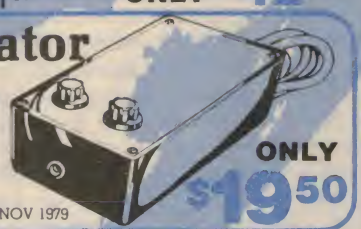
REF EA APRIL 1976 **ONLY**

240V Control Timer

Switch an appliance on for a preset period any time of the day or night. Large lighted LCD clock and tough die cast combine to give rugged reliability. Far more accurate than time switches enables time on period to be switched to 16, 32, 64 and 128 minutes.

Cat. K-3085 ~~WAS $49~~ **ONLY $42.50**

EA Metal Locator

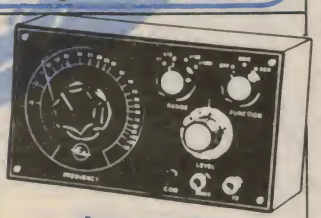


Want to make an economy detector? This must be the one! It uses the latest digital integrated circuitry, and is very simple to make, AND it won't break the bank! Significantly simpler circuitry means simpler operation too! Cat. K-3504

REF EA NOV 1979

ONLY $19.50

Sine & Square Wave Oscillator



Covers frequencies from 15Hz to 150kHz. This is one of the most useful pieces of equipment on the experimenter's bench. This simple design is easy to build and a great performer. Runs from a 9V battery. All parts are supplied including specially printed front panel, attractive 'Zippy' case and full instructions. Cat. K-3469

REF EA JUNE 1978

Only **$37.50**

Turn your old TV into a CRO!

Got an old B&W TV gathering dust in the corner? Turn it into an audio CRO! That's right: this remarkable kit turns any surplus B&W (or even surplus colour) TV set into a 300kHz audio oscilloscope! It gives good display at low frequencies, making it ideal for Hi Fi & audio display applications. All it needs is 100mV to drive it to full screen deflection. The large screen size means that it gives a dramatic display: just think of the non-technical applications of such a device: promotions, hi fi showrooms etc. If you can't afford a proper CRO – this could be the answer!

Cat. K-3060

Only **$29.95**

REF EA MAY 1980

See page 98 for full address details

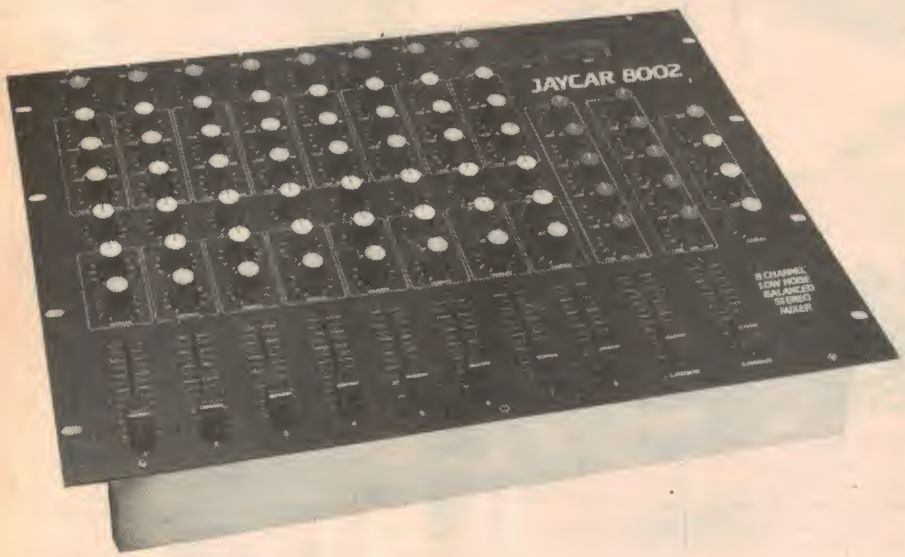
DSE/A480/3/JW

Easy-to-build design has a minimum of wiring

Balanced 8-channel Master Mixer: pt. 2

In this second and final article on the 8-channel Master Mixer we briefly describe the performance of the unit and give the full details of construction. Most of the work involves assemby and checking of the PC boards.

by LEO SIMPSON



Last month we discussed the general concept of the mixer and gave all the details of the circuitry which uses ICs throughout and no discrete transistors. Space did not permit us to talk about the actual level of performance which is achieved by the design so we will remedy that now.

While it is all very well to go on at length about the use of low noise integrated circuits and modern design, it is not until you come to measure the performance that you know that a design is good. This certainly applies to this present design. When we first appraised the design, it was in the form of many hand-drawn circuit sections. There was no complete circuit and certainly no performance specification.

However, detailed examination of the design calculations pointed to a performance which would give nothing away to current commercial mixers and would probably better them in some respects. So when we actually set out to measure the unit we expected that it would be good while still being on the alert for "nasties" such as supersonic oscillation, motorboating at certain control settings, hum or RF breakthrough.

We experienced none of these problems thankfully. And basic tests such as flatness of frequency response, gain and signal levels, and boost and cut in the equalisers were all spot on with the values depicted on the block diagram featured last month.

Signal-to-noise ratios and harmonic distortion figures are somewhat harder to quantify since they depend to a large extent on how the Mixer is used. To do this to best advantage you really need some practical experience and perhaps access to a book on the subject of mixing. One such book is "Modern Recording Techniques" by Robert E. Runstein, published by Howard W. Sams. This book is available from Jaycar at $18.95.

Having said that, one can expect that harmonic distortion figures will be in the range of .03% to 0.1% for all normal settings and signal levels. The distortion components are mainly low order harmonics too, with very little hum or noise.

And with good mixer practice, the signal to noise ratio can be expected to be −70dB or better with respect to rated output (ie, 1.2V RMS for balanced outputs or 614mV RMS for the unbalanced output condition). This applies to both balanced microphone inputs and unbalanced line inputs.

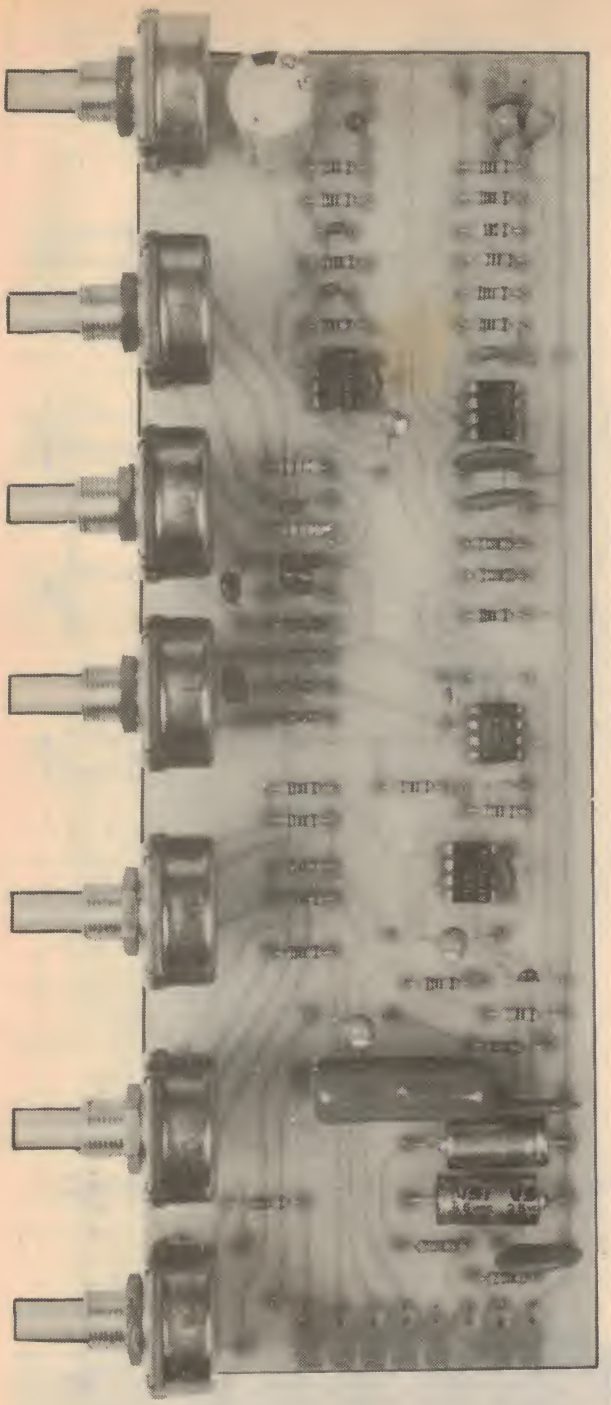
When you think about all the stages involved and the potential losses associated with mixing, these figures really do add up to a fine performance. Add to that a thoughtfully laid out panel and a minimum of wiring required in the construction and it all adds up to a winner. We think that this Mixer is a credit to the designer, Brian Chilcott, of South Woy Woy, NSW.

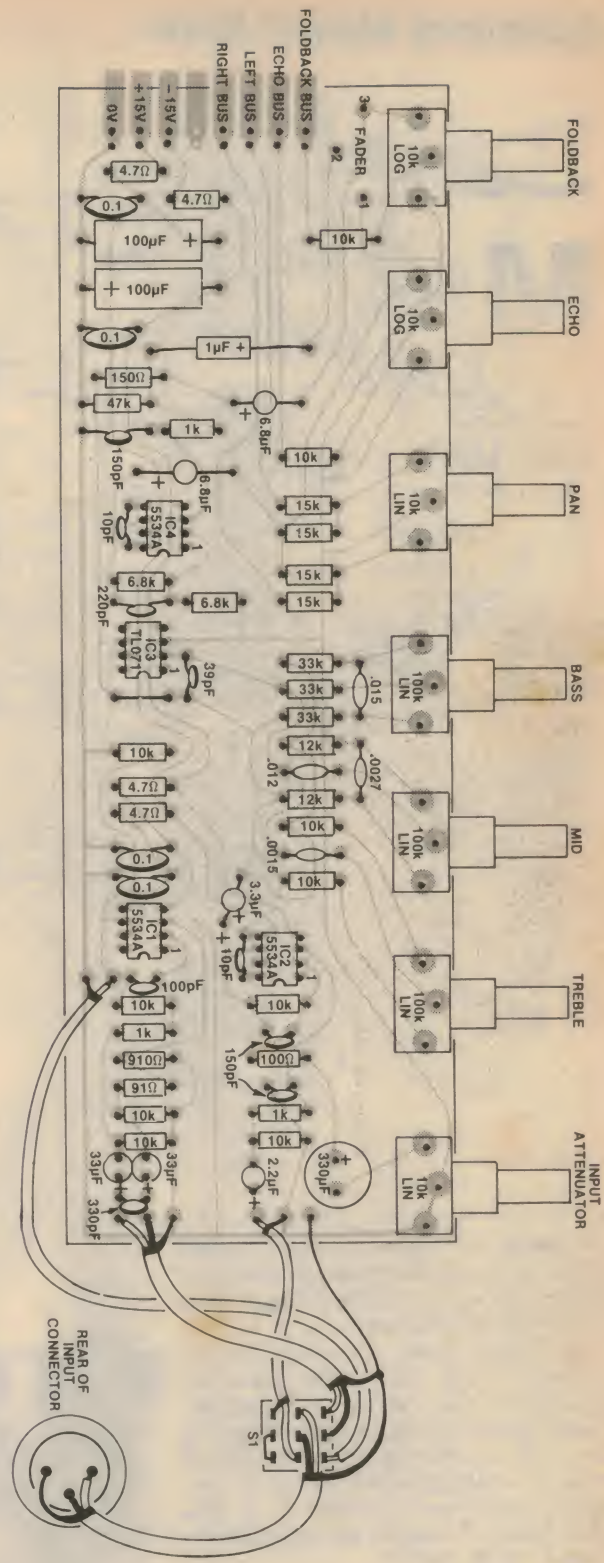
Construction

While there is a fair amount of assembly work on this Mixer — we would estimate about 15 hours for the average hobbyist — none of the work is really complicated or difficult. Assembly should begin with the smallest of the PC boards, the power supply, and the chassis. The power supply is accommodated on a small PC board measuring 65mm square. This accommodates the rectifier diodes, filter capacitors, two resistors, two three-terminal regulators and four bypass capacitors.

Assembly of the power supply board requires little comment except to note that orientation of all components, except the resistors and two ceramic capacitors, is important. Notice that the pin connections for the positive regulator are different from that of the negative regulator. Even so, the board has been arranged so that both regulators "face" the same way.

With this board complete, put it to one side and assemble all the hardware into the chassis base. This includes all the inputs and output sockets and the mains wiring. With the mains wiring complete, check your work carefully and then apply power. Check the secondary voltages of the transformer. This done, instal the power supply board and make the connections to the transformer secondary.





Eight of these preamplifier boards are required. We suggest that you build and test them one at a time. Note that the pots are soldered directly to the PC board which greatly minimises wiring.

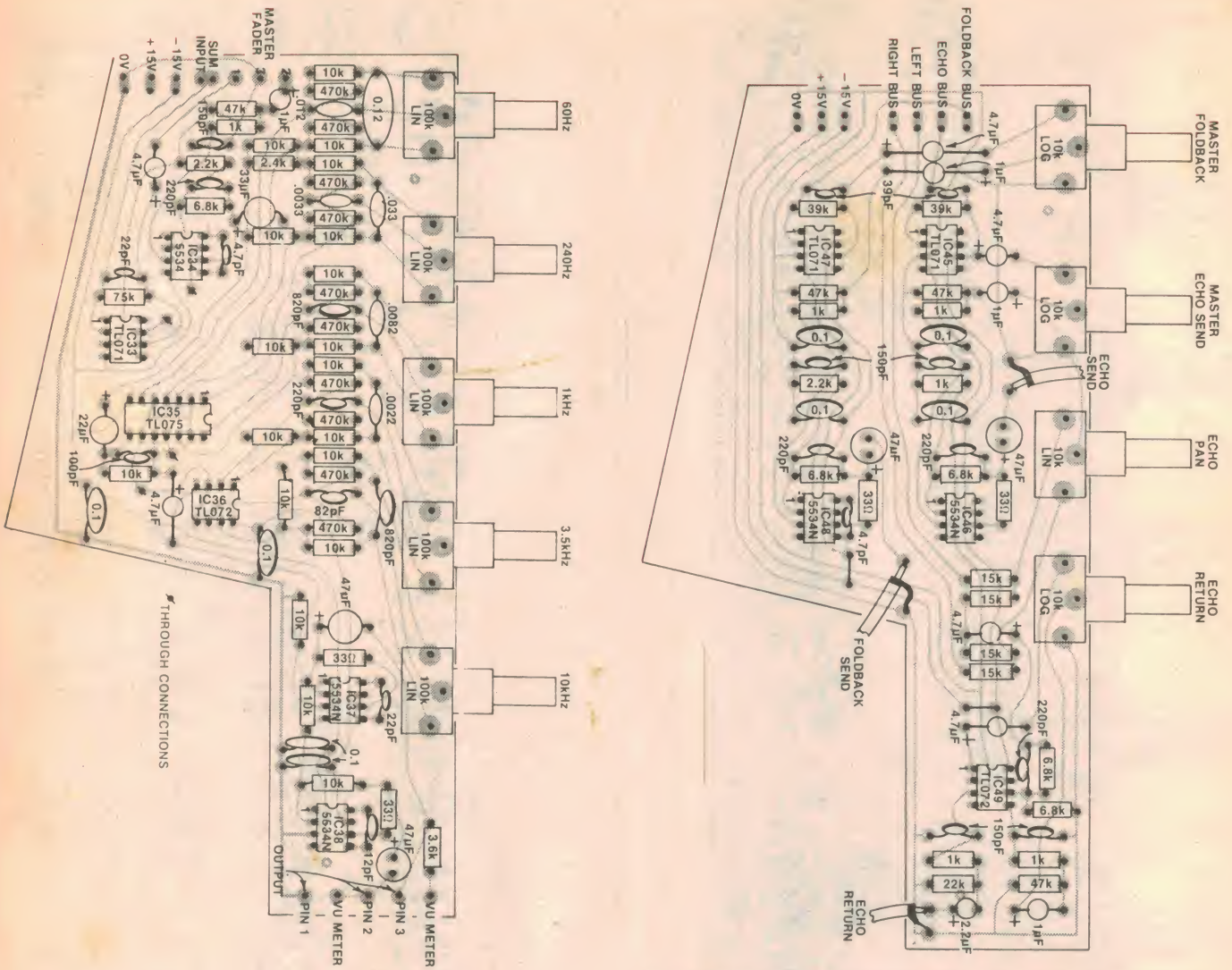
Apply power again and check the ±15V rails. They should be within about ±0.3V of the nominal value. If not within this range, something is wrong. Normally though, these voltages will be very close to the specified values. With the power supply working, the other boards can be checked as they are assembled.

Don't race ahead

it is important that you do not race ahead at this point and put all the boards together. We suggest that you assemble one of the eight preamplifier boards as the next step and then check. In this way, if you do make a mistake, you are not likely to repeat it seven times.

Again, little comment is required about assembly of the preamplifier board apart from the usual caution about polarisation and orientation of capacitors and ICs. Do not connect any lengths of shielded cable or hook-up wire to any boards until they have all been checked out.

With the first preamplifier board complete, carefully check it over for correct orientation of the components, correct colour codes on all the resistors and for the presence of any dry joints or solder splashes which may short adjacent copper tracks. Then place a suitably large piece of card in the Mixer chassis to sit



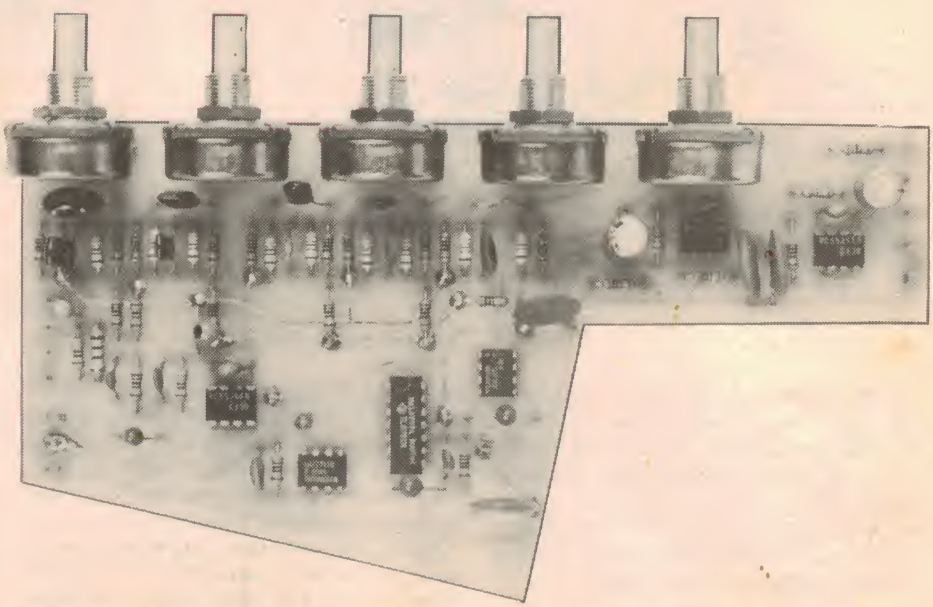
At left is the equaliser board with the effects board above.

the board on. Make the three supply connections, ensuring that you do not inadvertently swap over the 15V rails. That would lead to disaster.

Now apply power and check for the presence of the ±15V supply rails at the appropriate pins on each IC package. Check also that each op amp output is very close (within say ±50mV) to 0V. If there is a substantial DC offset of, say, several volts, the particular IC is probably faulty or one of the input pins is partially open circuit.

Audio tests

Further checks require access to an audio oscillator and an AC millivoltmeter at the very least and, ideally, an oscilloscope. If you do not have access to an oscilloscope or an AC millivoltmeter, further checks will have to wait until assembly has progressed to the point where the main equaliser boards are installed and the VU meters connected. With these operational, only



This is the five-band equaliser board of which there are two. Note that it is double-sided and has pin-through connections.

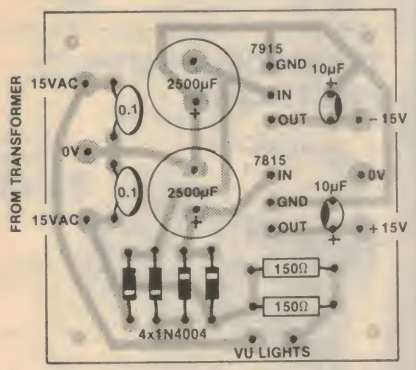
an audio oscillator is required for more tests.

If you are fortunate enough to have access to these requisite pieces of test equipment, you can at least check the gain of each stage on the preamplifier board and also the amount of boost and cut provided by the three-band equaliser. The maximum boost and cut at the three centre frequencies (100Hz, 1kHz and 10kHz) should be within ±1dB of 12dB and the "flat frequency response" condition should be obtained with the equaliser pots centred.

Don't fit the knobs

With the first preamplifier board built and tested, you can then repeat the process for the other seven preamp boards.

Incidentally, don't be silly enough to fit the push-on knobs to the pot shafts at this stage. Don't put them on until everything has been finished and tested as they are devilishly hard to pull off.



The power supply PC board accommodates two three-terminal regulators. Make sure they are installed correctly.

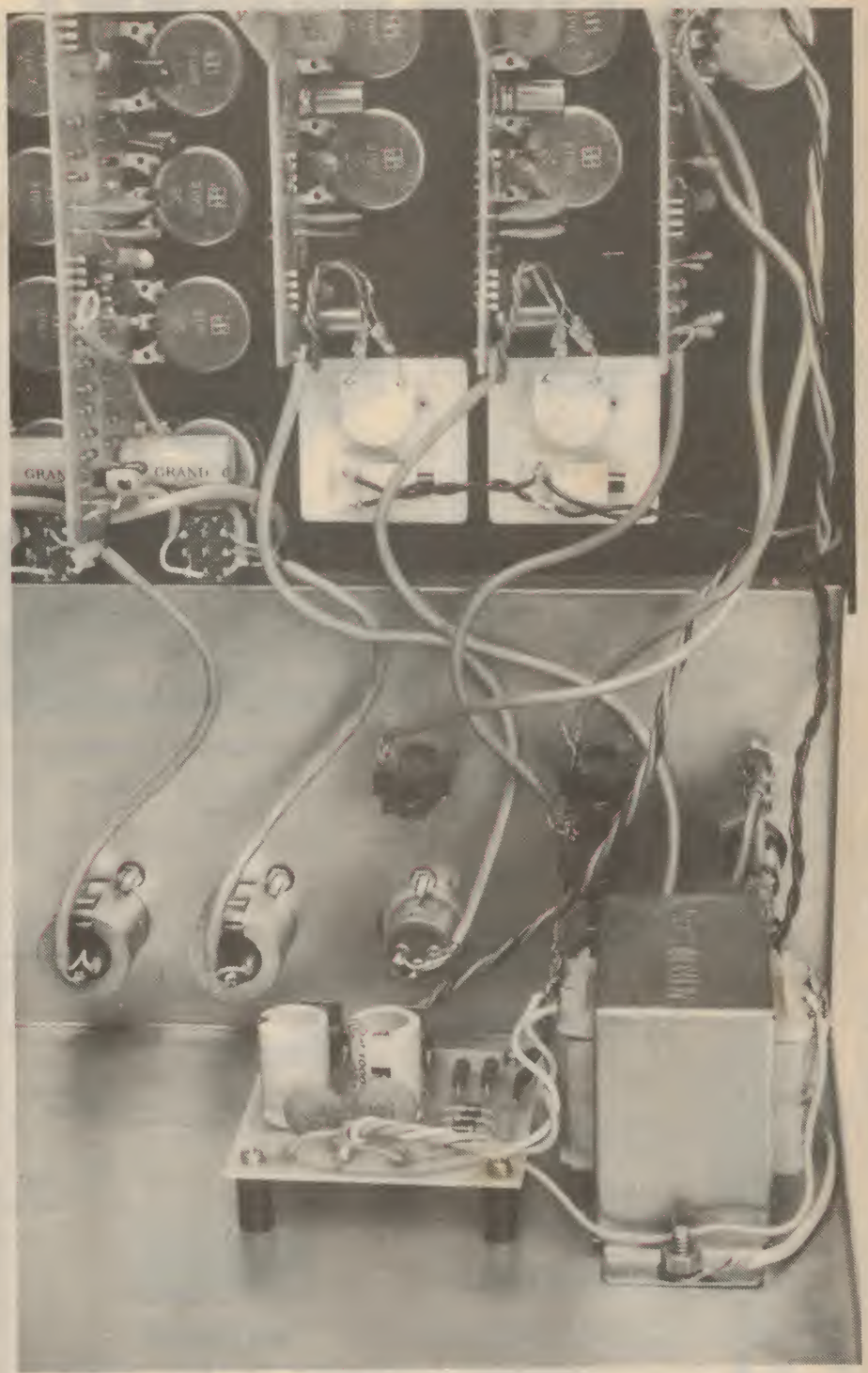
The two five-band equaliser boards and the effects board are irregularly shaped so that they fit over the power supply board and transformer. Again, the effects board has no special features and is straightforward to assemble. The checking and testing procedure can be similar to that described for the preamplifier boards.

Pin-through connections

By contrast, the five band equaliser boards are double-sided (ie, tracks on both sides). The boards do not use plated-through holes. Instead, through-board connectios are made via some of the component leads and some pin-throughs. In all cases, the particular component leads and pin-throughs must be soldered on both sides of the boards. Each of these connections can be checked with a multimeter, between the respective copper tracks on each side of the board.

From then on, with all boards complete, very little remains to be done apart from physically assembling the boards onto the panel. Interboard connections are all run in hook-up wire (use different colours for the different connections) while input and output connections are made via shielded cable. Note that the diodes for the VU meters are strung between the respective boards and the meters themselves.

Make sure you follow the diagram for the mic/line switch closely and terminate shielded cables as shown in the diagrams. After all that, you wil have a very fine 8-channel Mixer.



This photo shows the details of the input and output wiring and the VU meters. Note the diodes for the VU meters.

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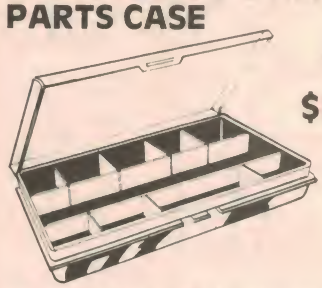

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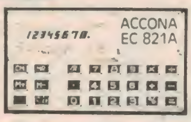

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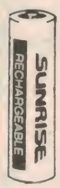

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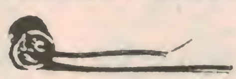

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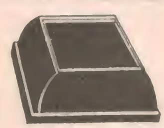

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H 0942 12mm Stickon	100.....	$8.50
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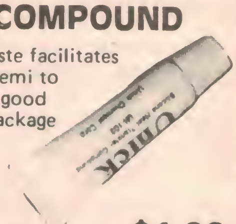

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Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

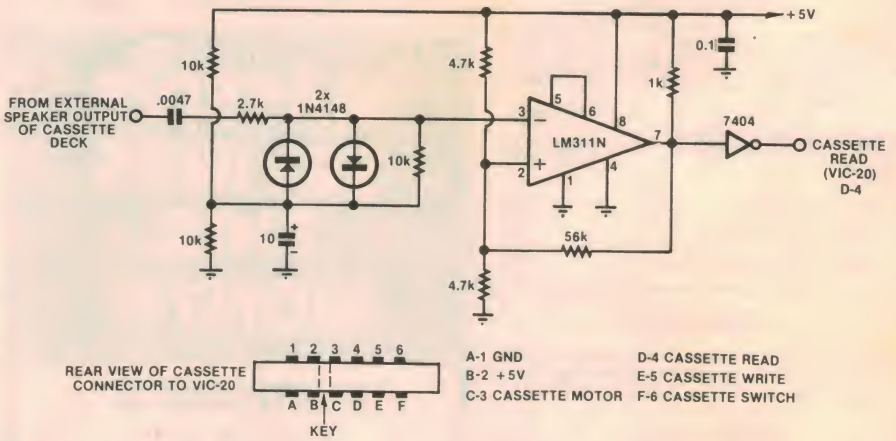
Cassette interface for the VIC-20 personal computer

The accompanying circuit is designed to allow a domestic cassette deck to be used to load programs into a VIC-20 computer. As such, it should be of interest to those who want to load pre-recorded programs without incurring the expense of a Datasette.

The main function of the circuit is to convert a sine wave output from the cassette deck into a TTL signal as required by the VIC-20. This is accomplished by means of a comparator and an inverter.

The comparator (LM311N) is connected as an inverting Schmitt trigger, with trip points of 2.4V and 2.6V, the input signal being symmetric about 2.5V. The 7404 acts as an inverting buffer to restore the signal polarity.

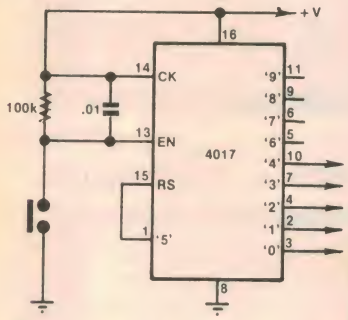
The cassette motor output from the VIC-20 is a nominal 5V DC at 100mA and may be used to drive the cassette motor directly (if suitable), or control it indirectly via a relay. The switch, S1, is set in the "On" position after the "Tape Play" switch on the cassette deck has been depressed.



The prototype needed an input signal of 2V(pp) and has proved to be reliable for loading commercially available programs, as well as programs recorded on a Datasette.

L. W. Murakami,
West Beach, SA.

Low-cost pushbutton sequential switch



Based on a CMOS 4017 decade counter, this simple circuit provides single pushbutton sequential switching. The only components required in addition to the IC and the switch are a resistor and a capacitor.

The counter is clocked each time the switch closes, the outputs "0" to "4" each going high in sequence. In this circuit, the counter is reset after the fifth position (the circuit was used as the input selector for a preamplifier), although there is nothing to stop you from using all the counter outputs.

The trick lies in tying the clock (pin 14) high and placing a clock pulse on the enable pin using a resistor and capacitor for contact debouncing. A bonus is that the circuit will "remember" the last position selected for over an hour after power is removed. This period may be increased, but don't make the capacitor too big as clock pulse rise time will degenerate.

The unit can be powered from any available 9-15V supply.

G. Ingram,
Pagewood, NSW.

Hold function for Digital Frequency Meter

Fig. 1

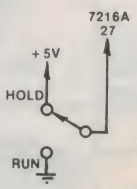


Fig. 2

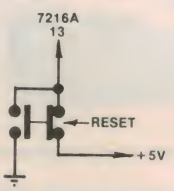


Fig. 3

Here is suggested modification to the Digital Frequency Meter described in EA December 1981. The writer finds the most convenient gating time is one second but the display time too short to log the reading. The circuit was therefore altered to hold the display by switching pin 27 of the 7216A from chassis to +5V.

This action holds the display as long as pin 27 is held positive and no further count occurs. Switching back to chassis resumes normal procedure.

In Fig. 1, the pushbutton switch has to be held in for the duration of the hold mode. In Fig. 2, the two position toggle switch is merely placed in the position required. The PCB has a jumper, connecting pin 27 to chassis, which can be removed and replaced by the 10kΩ ¼ watt resistor for Fig. 1, or omitted for Fig. 2.

The switch can be mounted on the front panel in place of either the 50MHz or 500MHz input socket which can then be mounted on the back drop next to its printed circuit connection.

H. S. Voake,
Inverloch, Vic.

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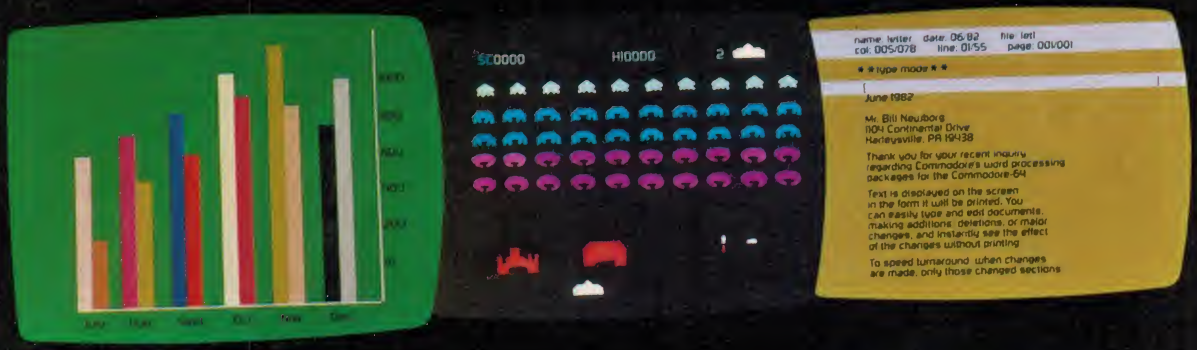

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–SHEARSON/AMERICAN EXPRESS

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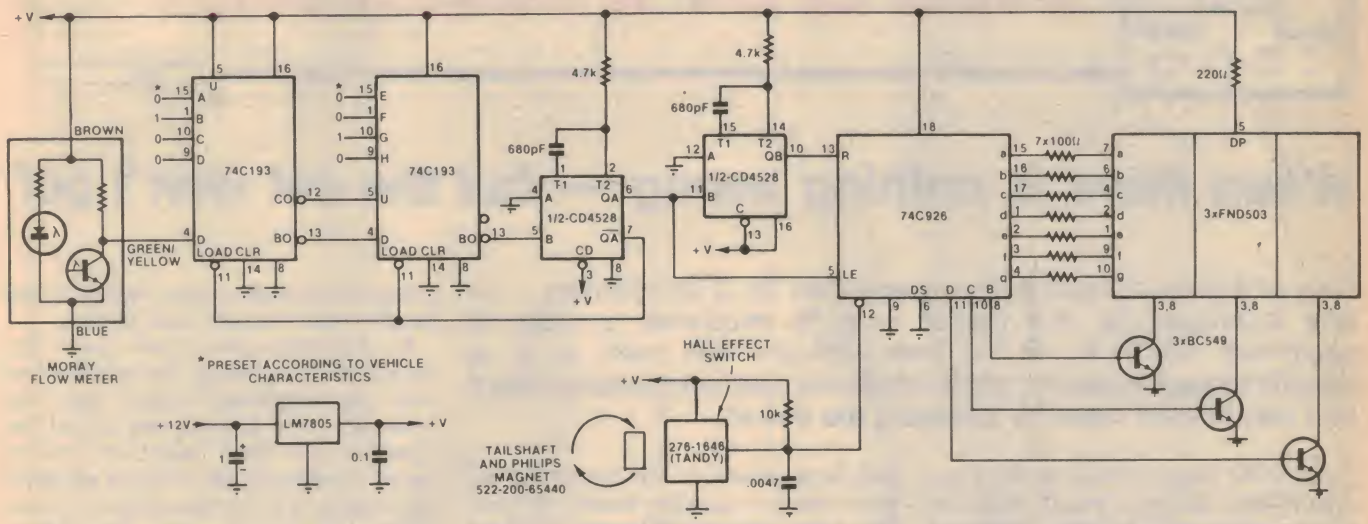


Following the recent articles on the Car Computer (July, August, September, October, 1982) a simple digital economy gauge became possible. To avoid the distraction of all the facilities of a car computer, a basic economy gauge, reading fuel consumption in kilometres per litre, was envisaged. The resulting design achieves this and uses only four CMOS ICs and a handful of discrete components.

The principle of operation is quite simple. A Moray flowmeter monitors the fuel flow to the carburettor and supplies a train of pulses to an eight-bit down counter made up of two 74C193 ICs. At the same time a Hall effect switch counts tailshaft rotations with the help of a small permanent magnet fastened to the tailshaft with Araldite.

The tailshaft pulses are fed to a four decade counter, 74C926, which drives a three digit display. This display is made to read directly in km/l. To do this, the display is updated, not on a time basis, but after a specific amount of fuel has been consumed. For any particular combination of tyre circumference, differential ratio, and fuel flow meter calibration, an amount of fuel – or a number of pulses from the fuel flow meter – is selected so as to give the correct readout.

A useful by-product resulting from basing the readout update on the rate of fuel flow is that the frequency of update provides a subjective indication of the consumption rate, even without noting the actual reading. The faster the display is updated, the faster the engine is using fuel. In the original setup, in a Gemini, fast acceleration can produce updates almost every second, whereas steady cruising at 60km/h, with a consumption of 14km/l, reduces this to every four or five seconds.

The flowmeter pulses are fed to an eight-bit down-counter made up of the two 74C193s, and this counter is programmed with the number of pulses required for a display update. The counter counts down from this figure, with every pulse received from the flowmeter, until it reaches zero. At this point the borrow signal (pin 13, 74C193) is fed to a monostable (pin 5, ½4528) which produces (at pin 6) a 3us latch signal for pin 5 of the 74C926. As a result the readout displays the number of tailshaft pulses counted since the previous update, and holds the display until the next update.

The same 3us signal from the monostable is also fed to a second monostable (the other half of 4528) which, 3us later, produces a reset signal for pin 13 of 74C926, which commences counting a new set of tailshaft pulses. Another signal from the first monostable (pin 7), which is actually the complement of the pin 6 signal, re-loads the down counter.

The system actually calculates consumption in m/ml, but this is the same as km/l. It also produces a tailshaft count which is 10 times the display figure required – in the interest of greater accuracy – and a decimal point is placed so as to allow for this. (Pin 5, FND503.)

To program the down counter, appropriate pre-set pins ("A" to "H") are taken high (+5V) and the remainder taken low (chassis). Each pin represents a binary column – 1, 2, 4, 8, etc – according to the accompanying table. Thus, to program the figure 66 into the counter – the value which was needed for the original unit when fitted to the Gemini – pins "B" (2) and "G" (64) were taken high. For a value of 67, pins "A," "B" and "G" would be used, for 60, pins "C", "D", "E", and "F" would be used.

	Binary Value	Pin No.
A	1	15
B	2	1
C	4	10
D	8	9
E	16	15
F	32	1
G	64	10
H	128	9

To determine the actual figure to be used for any setup, we use the following simple formula:

$$Y = \frac{10 \times NW}{G}$$

Where:

Y is the number of pulses per update;
N is the number of pulses per ml from the flowmeter;
W is the tyre circumference in metres:
G is the differential ratio.

The number of pulses per ml from the flowmeter is obtained from the calibration figure which accompanies it. The differential ratio should be available from the vehicle manual. The tyre circumference can be measured quite accurately by squirting a line of shaving

continued on page 142

The Serviceman

When there is nothing wrong — but the set won't go!

One of the most frustrating experiences for a serviceman — or any technician for that matter — is to encounter a piece of equipment which, by all the tests that one can make on it, is exactly to specifications, yet it refuses to function properly. And if one can make it work by changing the circuit . . .?

This story began several months ago and, while I felt sure that it would be worth writing up eventually, I hesitated to do so at the time, for reasons which will become clear as the story unfolds. I contented myself with making copious notes, not only to help me tell the story eventually, but also for use on the bench. As it turned out, I am very glad I did.

The story concerns a General GC-181, 46cm colour set, owned by a lady who had been a customer for several years. I had previously serviced the set for a minor fault some 18 months before this story began, at which time none of the symptoms in this story was evident. Unfortunately, the lady tends to be a bit vague in regard to describing faults, or remembering how or when they became evident.

OTHER SERVICEMAN

In fact, I was not the first serviceman to tackle this fault. It seems that she first had need for service at a time when business had slackened off a little and I had taken the opportunity to snatch a few weeks holiday. So, understandably, she called the first serviceman she could find.

Exactly how she presented her complaint to him, or what he did, I never did find out; the lady was just too vague about the whole thing. All she was sure about was that she was not very happy about the job he did, and that she called him back in an effort to get satisfaction. He had countered by claiming that the set was working satisfactorily, and went on his way.

So, on my return from holidays she called me in and related what had happened. Her description of the fault was that the picture was bending and that it had lines across it. On trying the set there was no question about the lines; they were very obviously vertical retrace lines. But I could find no evidence of the bending.

I spent some time checking out likely causes of picture bend, such as hum due to faulty filter capacitors, faulty AGC, etc but, without being able to observe the fault, it was a somewhat futile effort. In fact, I now suspect that the bending was a figment of the lady's imagination, because I never did find any evidence of it. If so, it may well explain the previous serviceman's confusion.

But the lines were real enough, though not all that obvious in the environment in which I first saw them. It was daytime, and the room was very brightly lit from several large windows. In these circumstances, the brightness level at which the set was running was not altogether inappropriate, though it was brighter than I would have liked it.

"They all look like this!"

But the real surprise came when I tried to turn the brightness down and found that the brightness control was fully retarded. This immediately raised the thought that there might be nothing more wrong with the set than excessive brightness; if it was too bright in broad daylight how much worse would it be at night? And were the retrace lines simply the result of this excessive brightness?

ROUTINE CHECK

I removed the back of the set and made a routine check of main operating voltages, particularly the main regulated HT rail. I could find nothing wrong in this regard, so decided to give it a routine grey scale setup, which I felt was probably necessary anyway, and hope that some clues might emerge as a result.

In this circuit the red, green, and blue static adjustments are provided by three 1MΩ pots (VR601, 602, 603) supplying voltage to the G2 electrodes of the picture tube. The three pots are in parallel (apart from the moving arms) and form part of a divider network between a 900V supply point and chassis. Between the 900V point and the pot group there is a resistor, R609, marked on the circuit as 220kΩ – 270kΩ, and between the other end of the group and chassis a 330kΩ resistor, R604. (There was, subsequently, some confusion over these values.)

Anyway, at this stage I simply went ahead with the routine adjustment. The result was certainly worthwhile in terms of overall picture quality, but did little to reduce the excessive brightness or suppress the retrace lines. I also tracked down and checked VR205, a 5kΩ sub-brightness control pot. It, also, was wound right back. (By the previous serviceman?)

At this point I realised that this was no job for the lounge room. I arranged with the lady to let her have a loan set so that I could tackle the job on my own bench where, hopefully, better facilities would

enable me to solve the problem.

Back at the shop I set things up again, but this time in more subdued light. This made the excessive brightness and retrace lines very obvious, but I still could not be sure whether they were one and the same fault, or whether I had a separate retrace blanking fault.

This set is made up of a number of small boards stacked at right angles to the mother board and each board can be removed and operated remotely by means of extension cables. I pulled the sync/video board out first, since this carries the blanking circuitry. More precisely, it involves a blanking transistor TR202, a diode X202, and a few minor components.

With the aid of the CRO I established that there was what appeared to be a healthy blanking pulse being generated at the collector of TR202. Unfortunately, the circuit diagram featured only a few waveforms, and this was not one of them. But I felt convinced that it was reasonable.

Nevertheless, I removed TR202, checked it in the tester, could find nothing wrong with it, but tried another one in its place, just to be sure. It all proved to be a wasted effort. I also checked the diode, X202, and the other components around the stage, but could find nothing wrong. Well, it seemed that there was nothing wrong with the retrace blanking system as such, lending weight to my original theory.

Since I didn't seem to be getting anywhere, and other jobs were waiting to be done, I put the set aside for a few days, but gave it a thought from time to time. The next time I switched it on was late one afternoon, when I was able to view it in really dark conditions. This only served to emphasise just how excessively bright the picture was, it being impossible to get a good black anywhere in the picture.

BRIGHTNESS FIRST

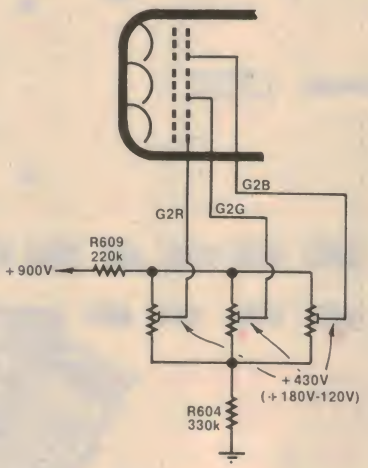
By now I realised that, regardless of the retrace line problem, I had to correct the excessive brightness. If the lines persisted after this, I would have to dig still deeper. In an effort to bring the brightness down I reset the G2 pots to the lowest possible setting, consistent with correct grey scale, but this had only a minimal effect.

So now I had the main brightness control fully retarded, the sub-brightness control fully retarded, and the G2 controls at minimum – and the picture was still too bright. So what next? The red, green, and blue driver stages (TR205, 206, 207) seemed a logical answer. If, for any reason, their collector voltages were down the result would be excessive brightness.

But again I drew a blank. The circuit shows this voltage to be 99V in all cases whereas, in fact, they were slightly higher, at around 110V. This should, if anything, tend to make the picture darker rather than lighter.

I went back to the neck board circuit with the G2 pots and associated circuitry, to double check the voltage on the G2 electrodes. This is shown as a nominal 430V, +180, –120. I had already measured this once, early in the piece, but checked it again to make sure. And, as before, it was very close to 430V. I also checked the 900V point from which this network is fed, and found it to be correct.

Next I concentrated on the two resistors, R609 and R604, which formed the two outside legs of the G2 voltage divider network. And here I encountered more confusion. I realised that I had two copies of the circuit, acquired at different times, but which purported to be of the same model. The only snag was, they did not agree in this part.



The G2 circuit as I found it, and as shown in one circuit. As shown in a second circuit it was quite different.

In the one I had first used, R609 was shown as 220kΩ – 270kΩ and R604 as 330kΩ. In the second one R609 was shown unambiguously as 330kΩ, R604 as 270kΩ, with an additional 22kΩ resistor (R605) between it and chassis, with the junction providing about 20V for the G1 electrodes.

As far as I could see, the set appeared to follow the first circuit. R609 was a 220kΩ and I pulled it out and checked it. It read low, about 195k, but this was only about 10% error, so I doubted whether it would be significant. Next I checked R604 (330kΩ) and found that this was virtually spot on. (A point of some importance, as it turned out.)

Which brought me to a dead stop. By all the measurements I could make, the set was exactly as the circuit prescribed; resistor values, voltages, blanking pulses etc, yet we still had excessive brightness. As the professional gambler complained,

someone was cheating; they weren't playing the cards they had been dealt!

In fact, it was that kind of thinking that prompted my next move. If the set could cheat – and it seemed to me at that moment that it was – then so could I. What would happen if I ignored the circuit and increased the value of R605? The way to find out was obvious and the first round figure that came to hand was a 560kΩ. Rash? Maybe, but I was determined to prove the point one way or the other.

I wasn't surprised when the picture came up much too dark, but I was very agreeably surprised when I set the sub-brightness control to its mid position, the G2 pots to their mid position, advanced the brightness control to reasonable setting, and finished with a near perfect picture. We now had good blacks, good tonal range, and no retrace lines.

I set up the grey scale again, let the set run for a couple of days, and returned it to the customer. Naturally, she was delighted.

But I was less than happy. The truth was I hadn't really found the fault, merely circumvented it. There had to be an explanation for the seeming anomaly that I had encounted; it was just that I hadn't been clever enough to find it. On the other hand, there was a limit to how much time I could spend on the customer's behalf, and I had fixed the set as far as she was concerned. It was the best compromise I could come up with.

And, as I intimated at the beginning, all that happened several months ago; so many, in fact, that I was beginning to believe that that was the last I would hear of the problem, in spite of my earlier misgivings. Then, a few days ago, the dear old lady was on the phone again with the news that the lines had returned and that the picture was too dark.

TOO DARK?

I did a double take on that last bit; granted the lines might have returned, but what combination faults would be likely to produce retrace lines and a dark picture? Certainly not one which would bear any relationship to the original fault.

As it turned out, the "too dark" description was a furphy. What prompted the lady to describe it thus is beyond me because it was exactly the same effect as before; an overbright picture with retrace lines. Apparently this was just another example of the old lady's general vagueness.

I brought the set into the shop again, determined to get to the bottom of things this time. I pulled the back off, intending to measure the appropriate voltages and then, on an impulse, rotated one of the G2 pots (the red one) to see what would happen. In fact, nothing happened and that was the best clue I had had so far. Normally it should have left me with either no red or too much red, according to which way I turned the pot.

I reached for the voltmeter and checked the G2 volts. And this was the second surprise. Whereas, on the previous occasion when I checked these voltages, I had found them to be almost exactly on the 430 figure given on the circuit (and which I had carefully recorded) they had now shot up and were wavering between 700 and 800V.

I checked the voltage applied to the divider, and found it correct at 900, and that left only the divider itself, and more particularly R609 (now 560kΩ) and R604, a 330kΩ. Remembering the lack of control I had observed on the G2 pot, I plumped for the 330kΩ at the chassis end of the network.

I pulled it out and connected it to the ohmmeter, whereupon the figures on the scale went mad and it was several minutes before they settled down to any kind of a meaningful reading. When it did it was no less than 14 megohms! Then, on an impulse, I reversed the ohmmeter connections to the resistor, and was greeted to several more minutes of meaningless readings, until it finally settled down to a mere seven megohms.

GAVE UP

I'm afraid I gave up at that point. I simply fished out a new 330kΩ and fitted it and then, while I was in the mood, I pulled out the 560kΩ I had previously fitted as R609, and replaced it with the specified value. I was tempting fate of course, (or Murphy) but the strange part is that it worked. With all the values now back to those specified in the circuit the set was working perfectly.

So why wouldn't it on the previous occasion? I had checked the offending 330kΩ and could not fault it. I checked the G2 voltages, and they were within specs. Yet I had to increase R609 to 560kΩ to make the set work. Now, after fitting a new 330kΩ suddenly everything had gone back to normal.

Frankly I can't explain it. It seems obvious that there was some strange fault in the 330kΩ – something I could not observe with the ohmmeter or which did not show up in my measurement of the G2 volts. But what, I don't know. Perhaps the two different readings on the resistor, suggesting that it was polarised, may be a clue of some kind. (Was it acting as a crude rectifier?)

And that, I'm afraid, is all I know about it. Unless I encounter another, similar, fault, I doubt whether we shall ever know. But if you encounter something like it, you might be able to clear it up a bit quicker as the result of my experience.

And, to finish off, here is something in lighter vein, involving the funny ideas people have about TV. I met the person concerned socially and, as is almost inevitable, when people learn that you are a serviceman, they always have a problem to discuss.

This fellow lived in fairly close proximity to the TV transmitters, and a long way from my stamping ground, so there was little chance of my encountering the problem first hand. The best I could do was listen politely and offer what advice I could.

ANTENNA PROBLEM

He went on to explain that he had recently fitted a TV antenna in his roof, under the tiles, but not shielded by any aluminium foil. (At least he knew that much.) The trouble was a dark horizontal band, about 25mm deep, right across the middle of the picture, on channel 2.

"It looks for all the world," he said, quite seriously, "like a shadow from one of the horizontal roof braces which is just in front of the antenna."

I did my best to keep a straight face, and assured him that, whatever it was, it wasn't a shadow of the roof brace. But I gained the impression he only half believed me, particularly as I couldn't offer an explanation as to the real fault.

Strangely enough, he provided the answer himself, though not immediately. I met him again several months later, and he reminded me of the problem. "I found out what it was," he said, "it is a ghost (interference) from another channel."

Apparently he had been looking closely at this band one night when the picture content was such that he was able to detect another image above and below the band. Switching quickly through the other channels he was able to identify the picture quite positively. (He thought it was channel 9.)

From his additional description of the image it soon became clear what was happening. The dark band was the vertical blanking period from the interfering station, the two stations being apparently in exact sync – the band didn't drift up or down – but out of phase. Or, at any rate, the signals as received by him were out of phase.

He went on to say that he had contacted his local serviceman and hoped he would be able to fix it. "But," he added, apparently determined to have the last word, "it still LOOKS like a shadow from the roof brace."

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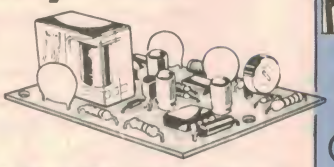

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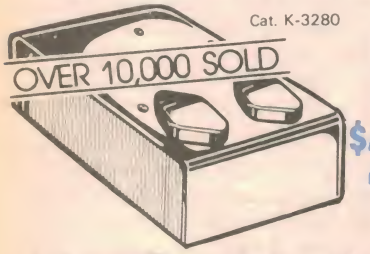

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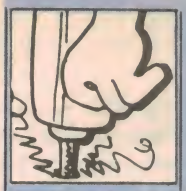

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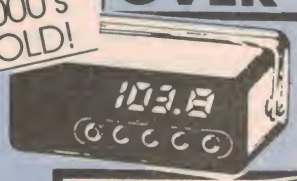

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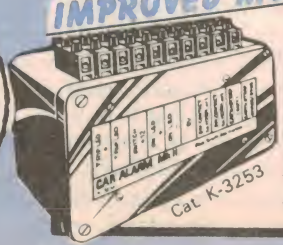

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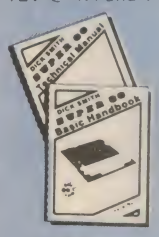

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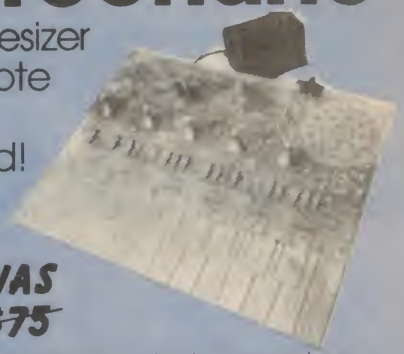

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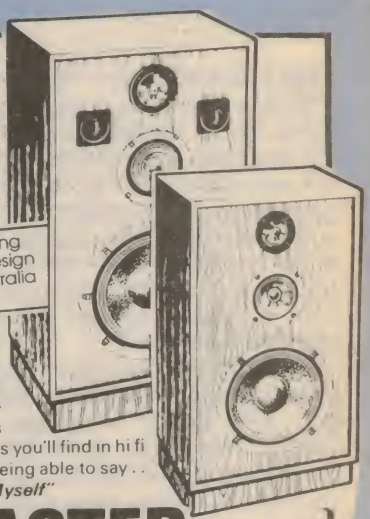

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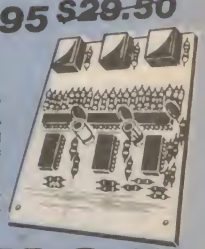


DICK SMITH ELECTRONICS

See page 98 for full address details

DSE/A480/TAW

INC IN NSW

Blow this instead of your driver's licence

Simple breath tester checks blood alcohol

Would you like to build your own alcohol breath tester? If it does nothing else, it will be a smash hit at your next party, even if it does scare a few guests into walking home. And at a more serious level, it might just be good enough to serve as a guide when you really need it. In any case, it won't break the bank.

by PHILIP WATSON

Like it or not, random breath testing is already a fact of life in most Australian states, led by Victoria and NSW – with the possibility that several other states will soon follow. And it is also a fact that it has drastically changed our way of life – and death! On the one hand some social activities have been severely restricted; on the other, the road toll has been drastically reduced in NSW since mid-December 1982.

The restriction on social activities is, understandably, the main topic in any "for" and "against" discussion on the whole concept of random breath testing. But, regardless of which side one takes in any such discussion, one point becomes quite clear; the difficulty of any one person knowing when they have had enough, or more importantly, too much.

As a rough guide the authorities suggest that three middies in an hour will take a person over the .05% mark, and that one middy an hour thereafter will keep them there. But this can only be a guide. A whole host of factors, such as body weight, body metabolism, the amount and type of food consumed before drinking, and how long before, can all effect the end result. Some people can safely drink more, some will have to drink less.

So how do you know? One suggestion is that people should be able to make their own test, using a tester provided by either the drinking establishment, or the person themselves. For many, the idea of a personal breath tester, which they could use in the privacy of their own vehicle, would be the ideal answer.

Unfortunately, it isn't quite that simple. Such devices are expensive, typical figures ranging from $100 to $200. Granted, this might be cheaper in the long run, if all risks are considered, but there do not appear to be many takers so far. And, on top of this, they have been criticized by the authorities as not necessarily being sufficiently accurate.

So how does our do-it-yourself tester compare with the commercial version. Well, you can make it for a fraction of the cost, which makes it a good deal more attractive. It uses the same sensing device as is used in several commercial units, and it should have at least the same order of sensitivity. Once

The breath tester is easy to build and fun to calibrate.

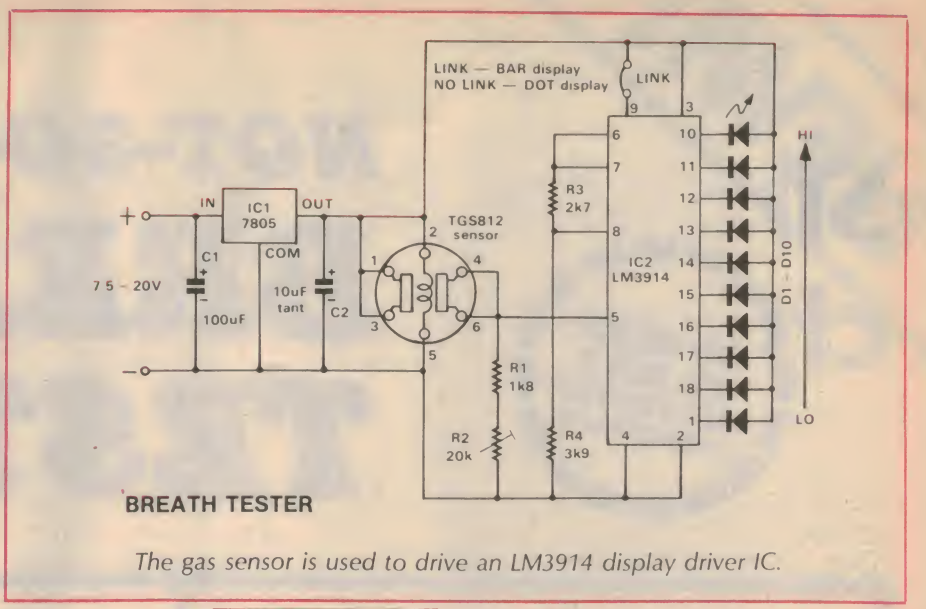
Larger-than-life size view of the Figaro TGS 812 gas sensor. The type 812 has a high sensitivity to carbon monoxide and ethanol, the latter characteristic making it suitable for use as an alcohol detector.

calibrated – by whatever means it is calibrated – it should hold that calibration for a long time.

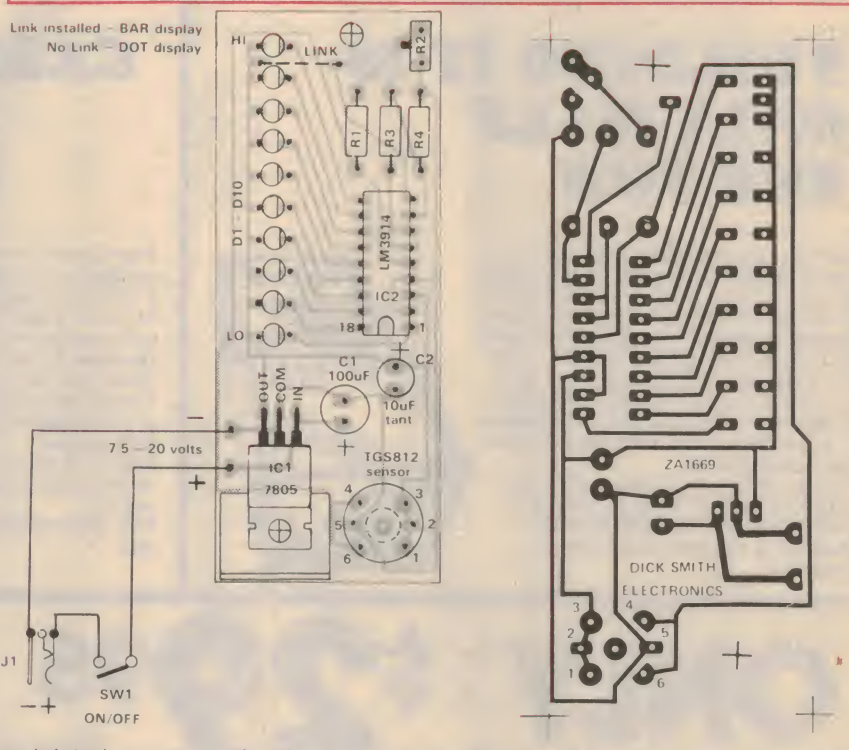
As with the commercial units, accuracy of calibration is the main problem but the home constructor at least has the advantage that he knows how to modify the calibration over a period of time, or in the light of experience, should it seem to be desirable. We will have more to say about calibration later on.

In summary, then, our unit is more in the novelty class than that of a serious, life-or-death, type of tester. It will be good for a laugh at parties, will make quite accurate comparative tests (does my breath contain as much alcohol as it did an hour ago, or is it going down?), and even serve as some kind of a morning-after gauge, following a particularly heavy indulgence. But more than that should not be expected of it.

This unit is being made available in kit form by Dick Smith Electronics, and this is probably the easiest way to get all the components. At the same time, most of the components would be available from other suppliers, with the possible exception of the gas sensor itself.



The gas sensor is used to drive an LM3914 display driver IC.



At left is the parts overlay diagram while at right is an actual-size artwork for the PCB. Note that the gas sensor may be mounted either way round.

Circuit details

The gas sensor is the heart of the device, and is the Figaro TGS 812. This device, and a companion unit, the 813, were both mentioned in the May 1977 issue when we described gas detectors for both exhaust gas analysis and petrol fume detection, the latter for use particularly in boats.

The type 812 unit is described as being sensitive to carbon monoxide (as found in car exhausts) and the 813 as being sensitive to methane and natural gases. It also transpires that the type 812 has a high sensitivity to ethanol, and it is this characteristic which makes it eminently suitable for use as an alcohol detector.

The sensing action itself is performed by a semiconductor based largely on tin dioxide (SnO_2) and which decreases its resistance by a factor of many times in the presence of the appropriate gas. The sensor also contains a small heating element which is used to purge it of any contaminating gasses which it may have acquired from the atmosphere while not in use. This operates at 5V and draws about 125mA.

The change in resistance can be made readable in a number of ways, but the one used in this circuit is both simple and effective. As can be seen from the circuit, the resistive element (pins 1, 3 and 4, 6) forms part of a voltage divider network across a 5V supply, the other part of the divider being a 1.8kΩ resistor and a 20kΩ trimpot (the calibration control).

The voltage developed at the junction of the two divider elements will vary from low when the sensor is free of gas and its resistance high, to high when the sensor responds to gas and its resistance drops. This voltage is fed to pin 5 of the LM3914 display driver.

This display driver has 10 output terminals which it turns on progressively as the voltage at pin 5 rises. Each output is capable of driving a LED directly, and this is the display method used here. To add to the effectiveness of the display the first five LEDs are green and the other five red. The output can be wired as either a dot display, one LED on at a time, or a bar display, with all previous LEDs remaining on as the next one is activated.

The choice of bar or dot mode involves only a simple connection. If pin 9 is left open the result is a dot display, if taken high to the supply rail it gives a bar display. The board as laid out provides for a suitable link to be fitted or omitted as desired. Whichever method is chosen, the idea would be to so calibrate the device that the five green LEDs represent the safe level; up to, but not exceeding, the .05% limit.

Power for the system can be any DC source from 7.5 to 20V with a capacity of 150-200mA. This is processed by a 7805 voltage regulator to provide a fixed 5V rail. Suggested supplies would be a 9V plugpack from the mains, or the 12V cigarette lighter socket in a vehicle. We understand that the kit will be available with a plugpack as an option, but a cigarette lighter adaptor as standard.

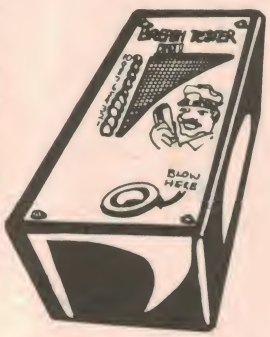
NEW!!

AS SEEN IN MAY ELECTRONICS AUSTRALIA

NOT-SO-RANDOM BREATH TESTER

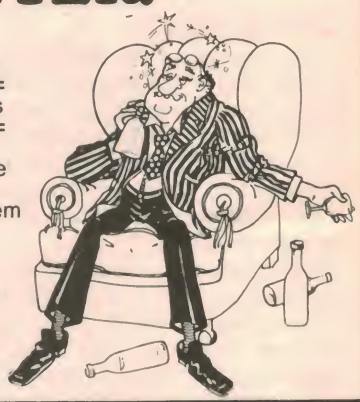
BUILDING IT IS ONLY HALF THE FUN

Yes! You can actually build your own breath tester! It mightn't stand up in a court of law - but so what? It will give you an indication of your ~~soberi~~ ~~sobreit~~ ~~soberei~~ how drunk you are! EXCLUSIVE TO DICK SMITH - this fantastic new kit includes the fully imported Figaro TGS sensitive gas sensor AT NO EXTRA COST - beware of other kits which do not have this top quailty sensor.
Operates from 12V DC - with car cigarette lighter plug supplied. Complete with 10 LED display indicating degree of alcohol detected.



CALIBRATING IT IS EVEN BETTER!

Yep! Drink to your heart's content. Let's see. 1 LED = 1 tinny (but was it Foster's or Swan Lager?) 4 LED's = harf a boddle of Jick Dineals. All ten LED's = the ovver harf of thu boddle, Thats if you can still see them at that stage of the calibvration.
AND IT'S ONLY $29.95
How much is your licence worth?
P.S. It's great for parties, too!



ONLY $29.95

Cat K-3391

WHILE YOU'RE IN A FUN MOOD..... GO GAMBLING!

It's easy with EA's new Electronic Roulette Wheel. Real casino type roulette - complete with sound effects of the wheel turning. Now if Roulette wasn't illegal, you could set up your own casino....
Easy to build, great fun to play.
Full instructions. Cat K-3389

ONLY $29.50

STOP PRESS

Other new kits for May.....

STEREO SIMULATOR Mk II

A brand new low-cost kit to give you simulated stereo output from a mono source - eg video cassettes, AM radio, portable cassettes, etc. Fantastic Value
Cat K-3421 (See EA April)

ONLY $19.95

MOTOR SPEED CONTROL

Run electric saws, drills, grinders etc down to zero rpm while still retaining torque. A must for the handyman.
Cat K-3081 (See ETI April)

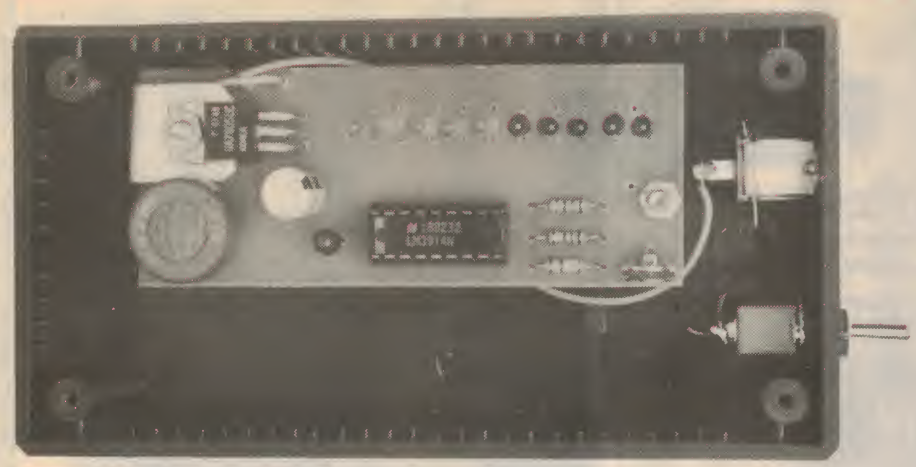
ONLY $22.50

DICK SMITH ELECTRONICS

See page 98 for addresses

A481/RW

Simple breath tester



The 7805 voltage regulator should be fitted with a small aluminium heatsink.

Construction

Construction is quite simple, with only a handful of components to be fitted to the printed board, and the arrangement of these is clearly shown in the accompanying overlay diagrams. The complete unit is assembled in a small plastic box. A novelty type front panel pattern, in Scotchcal or similar material, will be included in the kit and this, and the front panel, will have to be drilled to accommodate the 10 LEDs and the gas sensor. The label can be used as a drilling template.

The gas sensor is designed to allow a free flow of air through it, via a small hole in the rear face. To assist this free flow, there should be a hole drilled in the printed board directly behind the sensor, and a second hole in the back of the box in line with it. About 10mm diameter should be adequate for this latter.

The board is supported in the case on two 20mm long spacers and held by 30mm long screws which pass through them. One of these screws also passes through the mounting hole of the 7805 voltage regulator and a small aluminium heatsink. The regulator is mounted horizontally above the board, with enough clearance to admit a piece of 18g aluminium between it and the board. The mounting screw clamps the whole lot together.

The heatsink is simply a scrap of aluminium about 16mm wide by 30mm (or more) long, bent into an "L" shape and so proportioned that it bends over the end of the board. The power switch and the power input socket are mounted at the other end of the box. When mounting the LEDs on the board, mount them high enough above it to allow them to just penetrate the holes in the panel.

In use, the unit needs to be switched on for upwards of several minutes before use, the time depending on how long it is since it was last used, and how much contaminating gas it has encountered in that time. Initially, several or all LEDs may come on, then drop out as the heating element purges the sensor. When the last LED goes out the unit is ready to use. In the case of a new unit, the initial purge may take several hours.

The calibration control setting is also important. If it is set too high, a LED or LEDs may come on anyway, regardless of the condition of the sensor. If it is set too low, overall sensitivity will suffer. In our sample model we found that the control needed to be advanced about one quarter of its rotation from the negative rail end, and that this gave a good indication of when the sensor was purged.

At about this position it will be found that a non-alcoholic breath, ie, no alcohol for at least 24 hours, preferably longer, can bring up the first LED. Backing off the control very slightly – and it is quite critical – will eliminate this sensitivity and is probably about the best starting point for calibration.

Which brings us to the all-important question: Just how do you calibrate a device like this? At the risk of seeming to state the obvious, we suggest that the

Continued on page 89

PARTS LIST

1 Plastic box and panel, 130mm × 68mm × 40mm, H2753 or similar
1 Printed circuit board, ZA 1669
1 Etched label
1 Miniature toggle switch
1 DC power socket, 2.1mm
1 Plug to match
1 Cigarette lighter plug

SEMICONDUCTORS
1 TGS 812 gas sensor
1 7805 voltage regulator
1 LM3914 display driver
5 3mm green LEDs
5 3mm red LEDs

RESISTORS
1 × 3.9kΩ, 1 × 2.7kΩ, 1 × 1.8kΩ, 1 20kΩ miniature trimpot

CAPACITORS
1 100μF/16VW aluminium electrolytic
1 10μF tantalum electrolytic

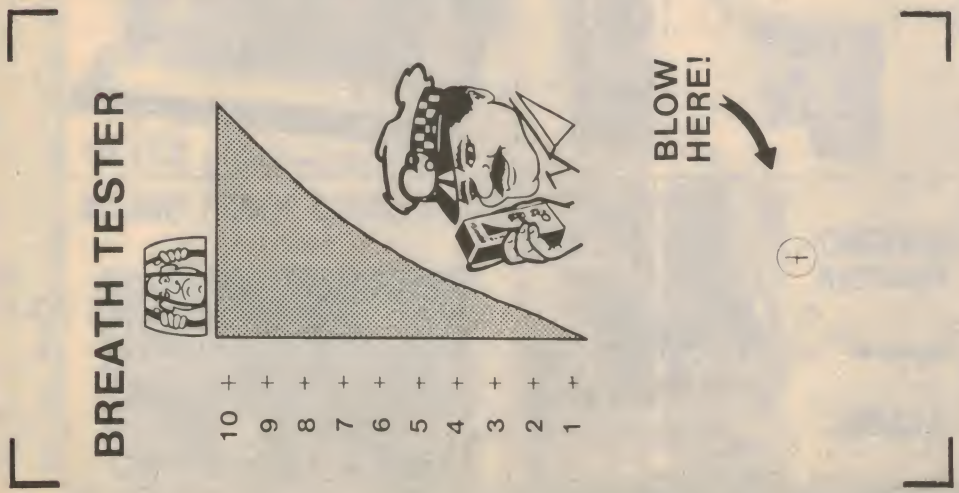
MISCELLANEOUS
2 20mm spacers
2 30mm long RH screws, with nuts
Scrap aluminium for heatsink
4 rubber feet with mounting screws
Figure eight cable as required

We estimate that the current cost of components for this project is approximately

$25

This includes sales tax.

Below is an actual size artwork for the front panel.



ROD IRVING ELECTRONICS

Stereo Simulator $12

Parts for this project cost approximately $12 for the **PCB** version. The self contained version costs about **$20** (plugpack supply not included). These prices include sales tax. **EA April 83**

Compuvoice $150

The cost of parts for this project is $150 excluding cost of a loudspeaker, plugpack supply or case. **EA April 83**

Touch-lamp Dimmer $20

The current cost of parts for this project is approximately

$20

for the Touch-lamp Dimmer and

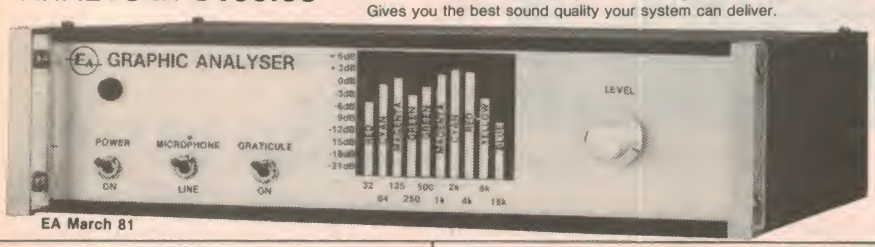
$9

for the remote extension. Sales tax included.

EA April 83

ON SCREEN GRAPHIC ANALYSER $109.00

The On Screen Graphic Analyser links your hifi to your TV set.
Features:
Six colour bar graph display (Standard PAL receiver).
Ten vertical bars in the display corresponding to the 10 octave bands.
Gives you the best sound quality your system can deliver.



EA March 81

FM WIRELESS MICROPHONE $8.50

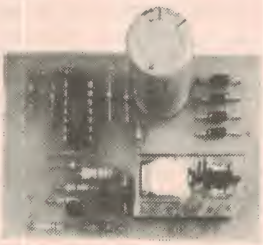
HOBBY ELECTRONICS May 81

CAR BATTERY MONITOR $9.50

Flat Battery! Don't get left out in the rain. Install a voltage monitor which monitors the state of your battery at a glance. **EA. October 80.**

UNIVERSAL RELAY BOARD $13.50

Operating a relay to switch heavy current or mains voltages is a common requirement in electronic control applications. This project permits a relay to be switched in a variety of ways and from a variety of inputs. **ETI May 81**



LOW FUEL INDICATOR EA March 81

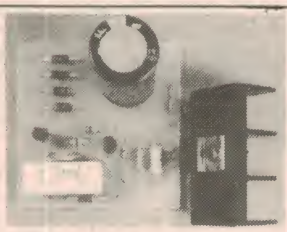
$16.50

AM TUNER $99.00

ETI 475 September 80

Includes plug pack and punch metal work

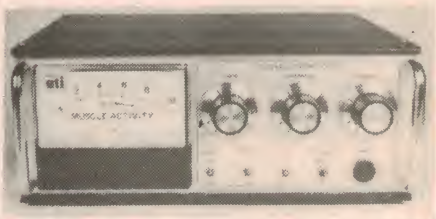
$9.50 MINI DRILL SPEED CONTROLLER



Here's an easy to assemble project for a simple speed regulator for miniature DC electric drills. **ETI July 81**

ELECTROMYOGRAM $99.00

ETI Top Projects Vol 6



CUDLIPP $12.00

A fascinating Electronic Cricket with just two ICs. The Cudlipp can be used to bug your Home, Office or Board Room. Great fun. **EA February 82**

SERIES 4000 SPEAKER KITS

Speakers and crossovers	$450
Speaker boxes	$249
Crossover kits	$189
Complete kit	$699

EPROM PROGRAMMER EA July 80

Horwood Case Supplied **$77.50**

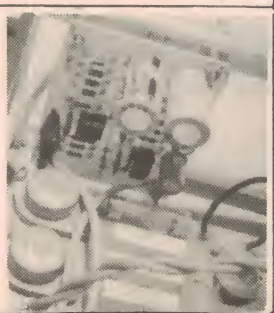
HUMIDITY METER: $22.50

ETI 256

BRIDGING ADAPTER

ETI March 82

$10.95



SLIDE CROSS FADER $85.00

EA November 81

425 High Street, Northcote 3070, Melbourne, Victoria. Ph (03) 489 8131. Telex No. 38897
Now open at 48-50 A'Beckett Street, Melbourne Ph 347 9251

Address lines A10 to A14 are connected to the 74LS138 3-to-8 decoder to provide CE (Chip Enable) signals to each 1K bank of RAM when the decoder is enabled by the MREQ (Memory Request) signal from the Z80 bus connector of the computer. In the original design pin 5 of the 74LS138 decoder was wired to ground. This track must be cut and the pin connected to A13 of the ZX80. The connections to the decoder are as follows:

Pin 1 A10.
Pin 2 A11.
Pin 3 A12.
Pin 4 MREQ.
Pin 5 A13.
Pin 6 A14.
Pin 15 Page 0 select (RAM CS).

As installed the expansion board allows a total of 8K of memory with 1K on-board the ZX80 and 7K on the expansion board. Page 0 of the expansion memory (the second pair of memory chips from the right hand side) is not used and need not be installed.

The address area occupied by the 1K memory on the ZX80 board is decoded to produce an output on Y0 (pin 15) of the 74LS138. Y0 is connected back to the CS point of the ZX80 expansion bus connector to control the 1K RAM chips already installed in the computer. When the ZX80 references an address higher than that of the internal 1K Y0 disables the on-board memory block and the 74LS138 selects the appropriate block on the expansion board.

Address A10-11 and A12-13 decode one of eight 1K blocks from memory locations 16384 to 23384 (decimal) in response to a memory access request (MREQ) from the ZX80.

tional 7K of memory to their computer. In the case of a MicroAce with the additional memory components installed Chip Select signals are generated internally and would conflict with those produced by the decoder on the expansion board. Memory chips U4 and U5 and the OR gate U17 must be removed from the MicroAce board and connections made as described for the ZX80.

Operation of the extra RAM can be checked quite easily. With 3K of RAM on the expansion board (for a total of 4K of memory in the system) the end of memory is at address 20479 (4FFF). We can find this area and check that the ZX80 is using this address with the following short program:

```
10 LET K=20479
20 FOR I=1 TO 200
30 PRINT PEEK(K);".";
35 LET K=K-1
40 NEXT I
```

If all is well the screen should display a couple of lines of decimal numbers followed by all zeroes. The zeroes are in fact empty memory locations. POKEing a number to one of these addresses and reading it back will verify operation of the extra RAM. Try

```
15 POKE 20450,33
```

in the program given above and check that 33 appears on the screen.

If all that appears on the screen are rows of the number 64 there is a problem. A screen full of 64s means that the ZX80 cannot find the expansion RAM. Switch off the computer and carefully check the orientation of all components and connection leads. If the new memory responds correctly to PEEK and POKE statements then settle back and enjoy your newly expanded computer.

That's all there is to it – a simple, economical memory expansion that lets the ZX80 run programs big enough to challenge even the most experienced users.

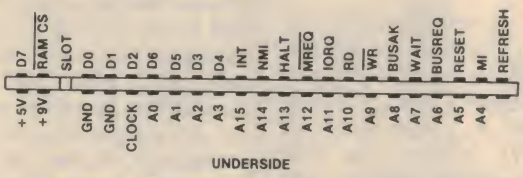


Fig. 2. Expansion interface connections for the ZX80. Not all connections are used.

Address lines A8 to A5 and the WR signal from the computer are connected to the pads provided directly behind the 74LS138.

The row of solder pads in the centre of the expansion board closest to the RAM chips are the connections for the data lines.

The top row of connection points, in front of the 74LS04, are for the remaining address lines with the connections for 5V and ground as shown on the board overlay pattern. Address lines A0 to A4 and A9 are connected here.

Users of the 2K MicroAce can also take advantage of this design to add an additional 7K of memory to their computer.

PARTS LIST

14 2114 1K × 4 bit static RAM chips
1 74LS138 3-to-8 decoder
2 74LS04 hex inverters
9 0.1µF ceramic capacitors
1 PCB, 218 × 81mm, coded 78up10

Solder, tinned copper wire, ribbon cable and 23-way PCB edge connector.

Breath Tester ctd.

"calibrator" drink three middies in an hour, breathe into the tester, and set the calibration control to bring up the first red LED (No. 6).

While this procedure takes no account of all the metabolic and other variables we mentioned earlier, it at least provides a starting point. And it would permit comparisons with other drink/time combinations, such as low alcohol drinks, wine or spirits, consumed over different periods, with or without a meal, etc.

A better approach would be to persuade a group of several people to make the same test, ie, three middies in an hour, at the same time. The final calibration could then be a rough mean of the results, taking into account individual body weights, and any other pertinent variables.

Better still would be the ability to compare the device with a professional unit, as might be provided by the club or hotel management, but not THE professional one. Once calibrated at this level the device could be accepted as a reliable guide, if used with reasonable caution.

So there it is; a simple low-cost device which will be fun to build, can be fun to use, and will almost certainly be fun to calibrate. And who knows, with some care and a little luck, it might just turn out to save a life.

Circuit & Design Ideas

A guide for contributors:

If you have a bright idea, handy hint or novel circuit you have developed, why not submit it for publication?

But take care how you submit it. A little attention to the following points should increase your chances of it being printed.

Size: Study the space we allocate for typical articles and use this as a guide. Be concise.

Details: State clearly the problem which inspired the project, and how it is designed to overcome it. Explain how the circuit works, in as much detail as possible. The same applies to mechanical details, if relevant. (We would rather condense this part, than have to work out details ourselves.)

Presentation: Type your copy if possible, with double space between lines. Handwriting is acceptable, but must be legible. Try to follow our style in regard to technical abbreviations, etc.

Payment: We pay between $5 and $25 per item, depending on size and appeal.

So go to it!

Letters to the editor

The Compact Disc can be copied

I was interested to read the editorial space devoted to the "Digital Audio Disc". DAD appears to be just the shot in the arm the world hifi market has long needed. Unfortunately many people seem to be under the impression that by buying a DAD player, and adding it to their system, they'll instantly get the best available in high fidelity sound. It's not necessarily so.

If say, Mr Smith were to buy a Compact Disc Player and connect it to his "X Brand" modular system, (the player alone may have cost more than the rest of the system!) he might notice some improvement, but the set-up will hardly do justice to the greater dynamic range, signal to noise ratio etc, available from the compact disc.

Unfortunately, the adage "that a given system is only as good as its weakest component" will ring even more true in the coming digital age! Many people are going to have to look long and hard at upgrading the rest of their systems to benefit fully from the advantages of PCM.

Manufacturers of PCM software are probably revelling in the fact that they have at last what on the surface appears to be a product that is extremely difficult if not impossible to satisfactorily copy. Even using metal tape and Dolby C the results of copy from a PCM disc will leave much to be desired compared to the original.

Unfortunately for them, where there's a will, there's a way. As the diehard copier has probably noticed there is such a device as the SONY PCM-FI digital audio processor which when used with the SONY SL-FI or almost any domestic video recorder, will allow him to record 3 or 4 PCM discs on a $15 video cassette with almost unnoticeable, if any, reduction in audio quality. Of course, the PCM-FI doesn't come cheaply, but if he can afford a good hifi, a video recorder and a Compact Disc player, the dedicated copier (or bootlegger?) would scarcely find the price an obstacle.

M. A. Coursey,
Elizabeth Grove SA.

Wanted: a guru for the Super-80

I would like to ask, "Is there ANYONE out there who can program a SUPER-80 computer in machine language?" And if there is, would they be willing to share their knowledge around with myself and many other "novices" who built this great little machine.

Having spent a small fortune on books such as Zak's "Programming the Z80", and being now thoroughly confused I am at a loss where to turn. Programming in Basic is fine, to a point – but the limitations soon become obvious. Any published information that I have seen to date (Super 80 Manuals etc) presume that the builder is a "Boffin" with a broad knowledge of computing, and conversant with Basic and Machine code. But what of those like myself who are doing it the hard way?

Please Mr Editor, publish an article or two on programming the Super 80 in machine language and I'm sure you will end the misery that many of us find ourselves in. Thanks for a fine magazine each month and the wide diversity of articles and projects.

C. Stevenson,
Mt Druitt, NSW.

Australia — a country of "catalog engineers"?

Australia has become a country of catalog engineers. Every government department and large business organisation is besieged by beautiful people immaculately dressed with briefcases bulging with glossy colour photographs of exotic equipment. They have masses of pretty little gimmicky gifts from calculators to Biros and are delighted to accept any orders.

But if one actually wants to buy something it is a different story. "Well, we don't actually have it in stock, but of course we can get it for you." The stock answer is six weeks delivery, but when asked to confirm that in writing all kinds of doubts and difficulties come up and the "six weeks" usually turns out to be nearer six months.

Of course if the equipment is faulty it is fully guaranteed and they have a highly trained technical staff. But again, on closer questioning, it turns out that they haven't actually yet even seen this particular equipment and they wouldn't have any spare parts, let alone any specialised test equipment. The thing would probably have to be sent back to Timbuktu or wherever and by the time a workable version arrived it would be obsolete anyway.

For any medium or small firm which is actually trying to produce something and compete with overseas firms, the situation is a disaster. Occasionally at trade shows there is a real piece of equipment actually working. But then catalogs and specifications are not available. In one case after repeated efforts a specification sheet was obtained but by that time the instrument had gone interstate. Why? Because there was an exhibition being held. "But I was told it was for sale." "So it is and when it is sold we will order another from overseas." It was for sale, take it or leave it, at the full retail price, after having been carted all over Australia to countless exhibitions involving hundreds, or thousands, of hours of use.

In another case one representative explained they could not keep a particular item in stock because there was very little demand for it. A few days later another person inquiring after the same items was told they had no stock because the demand had been very heavy.

In a third case, when asked why the box containing a piece of test equipment had been opened, the beautiful person explained that it was their policy to look over everything and check it was suitable for Australian conditions. When the person who bought it set it up to use it it turned out that the flex still had the American 3-pin plug on it. Another "new" instrument had "demo" written on the box which had also been opened. When some of these facts were pointed out to the beautiful people concerned they ceased to be quite so beautiful. They obviously preferred catalogs.

One wonders whether the firms which have these people as their local agents know or care what is going on. Probably not since Australia is insignificant as a market except for television sets, CB radios, and home computers; and as long as small business organisations haven't a hope of competing without the necessary tools and equipment, it is likely to remain that way.

R. Hartkopf,
Alphington, Vic.

Uses the 2650 expansion board

Memory expansion for the ZX-80

This suggestion from a reader is an easy method of expanding the memory of ZX80 and ZX81 computers. Using a printed circuit board designed for the EA 2650 computer the project adds 7K of memory to a 1K ZX80 and is simple to build and install.

by ROBERT CHALMERS

26 Bittern St, Inala, Brisbane, Qld, 4077

The usefulness of the ZX80 lies in it's value as an effective low cost way of learning the principles of computer operation and programming. With its small memory however (1K in standard versions) there is just not enough room for ambitious programs. A 16K RAM expansion pack is hard to justify, often costing more than the computer itself so the search was on for a suitable alternative.

Let me say at the outset that credit for the original design must go to David Edwards, who gave complete instructions for an 8K RAM expansion board in an article on the 2650 computer in the December 1978 issue of "Electronics Australia".

The adaption described here will give a total of 8K of RAM which can be built up 1K at a time depending on funds available. The printed circuit board, coded 78up10, is available from Rod Irving in Melbourne or RCS Radio in Sydney and provides an excellent opportunity for those who like to "brew their own".

Very few modifications are required and the fully populated board has only three interface chips, for page select and address buffering and a total of fourteen 2114 memory chips, arranged in pairs to provide 7K of memory in seven "pages". The first 1K, page 0, is already resident on board the ZX80.

You may need to upgrade your power supply as the full board will draw slightly over 1A at 5V but this should present no problem as suitable plugpack type supplies are widely available.

Fig. 1 is a repeat of the overlay pattern of the original board with the new connections labelled. 23-way edge connectors to suit the expansion bus of the ZX80 and ZX81 are available from Timedata, 57 Swallowdale, Basildon, England, for £3.50, although suitable connectors could be cut from a larger section of double-sided PCB edge connector. The connector pins should be on a 2.54mm pitch. Alternatively a 25-way D-type connector could be wired directly to the copper tracks of the expansion port. Fig. 2 shows the connections of the ZX80 expansion port.

There are 22 wire links to be installed on the expansion board and it is recommended that sockets be used at least for the RAM chips. Remember that these are MOS devices so take precautions to prevent them being damaged by static discharge in handling. There are also nine 0.1μF bypass capacitors on the board.

The circuit

Address lines A0 to A9 from the ZX80 are buffered by two 74LS04 hex inverters to drive the RAM chips. The data lines are not buffered as the buffer circuit originally used on the 2650 board is unsuitable for the ZX80 but buffering is not necessary in any case. The buffers, two 81LS95 chips, are not installed in this version of the board.

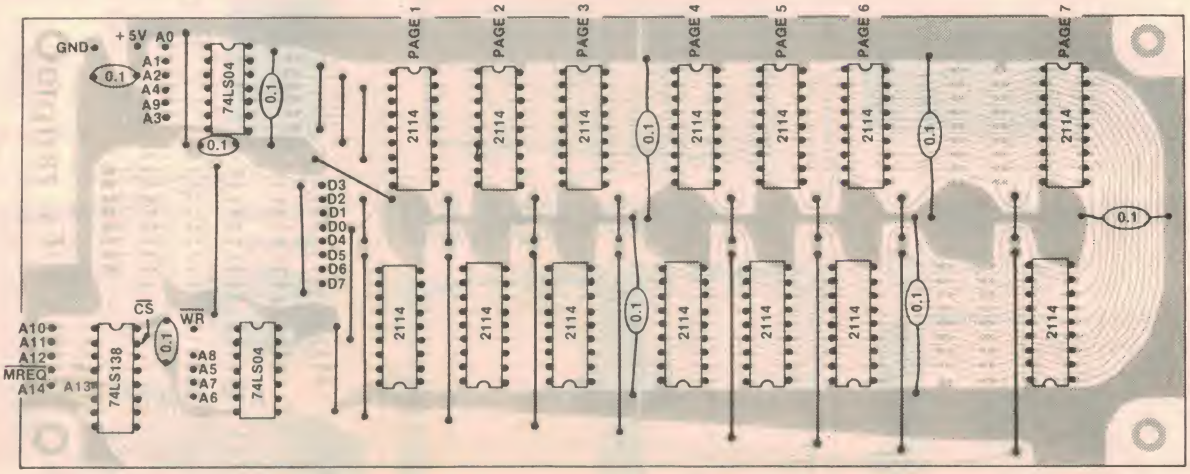


Fig. 1. Note that the two data buffers and one pair of memory chips on the original board are not used in the ZX80 version.

Information wanted on airforce wireless reserve

The RAAF Wireless Reserve was created about 1931 by Howard Love (then VK3BM), President of the WIA Victorian Division and the Air Board of the RAAF.

It was realised that the Radio Amateurs of Australia represented a great potential of emergency communications to the RAAF in providing a group of trained signals operators. At the outbreak of the 1939/45 war some 200 operators were called up for full time active service from all States.

The Air Force appointed Bob Cunningham VK3ML, with the rank of Pilot Officer to command and organise this Reserve. Bob now wishes to write a history of the RAAF Wireless Reserve from available information. Unfortunately there are many missing gaps in the 1931-1939 years where records of members and their activities are unavailable. He would therefore be grateful if former members of the Reserve would provide him with known lists of members and any items of interesting activities worth recording in the proposed history.

Please forward any such information to VK3ML at 384 Glenferrie Road, Malvern, Vic 3144.

Comments on the Fuel Consumption Meter

I was very interested in your comments about EA's fuel consumption meter (FCM) but may I add some helpful criticisms.

You say the actual value of consumption is of little importance. May I disagree and add that the actual value of consumption is directly related to the car's tuning and efficiency (eg – dragging brakes, dirty plugs etc). Most of today's drivers are fully aware of their own "bad fuel habits" and want to see if better tuning, less drag from towing and similar long distance/long period problems can be improved.

Point two, the meter needs to be more accurate. If you have 20 LEDs, ie 5 per 10 litres/hour range, you only get a reading for every 1 litre/hour graduation (or every 6.3 miles per gallon on the old system) – not very good is it?

Point three, the range chosen is not very realistic! For example it is unlikely that anyone will go below 6 litres/100km or higher than 60 litres/100km. These are the useful ranges – all else is idling or full throttle both of which are of no interest mostly because you can't look at it objectively anyway.

May I suggest that the more usual range – cruise and overtaking driving – gets a bigger scale slice than the extremes of the ranges. I think I'll wait till you upgrade it first before I build one.

Also just as a point of interest related to the use of vacuum gauges, which provide exactly the same information as you are quoting for the FCM, these relatively cheap devices can be used for predicting most engine ills you will think of. Their use as economy meters is purely secondary. Your comment about their uselessness is not taken therefore, but I might add that if EA can produce an electronic device capable of accurately predicting all those functions/disfunctions which a VG can, I will build it and buy a year's subscription to EA as well!

R. G. Hunt,
Glenalta, SA.

COMMENT: Even small-engined cars will push the fuel consumption reading to beyond 40 litres per 100 kilometers when overtaking or accelerating from rest. And big-engined cars can easily show readings of less than eight litres/100km when carefully driven at normal speeds. Our experience has shown that the range of the unit is valid and useful. It is far more informative than a vacuum gauge.

New location for RMIT "Radio School"

Many of your older readers would perhaps appreciate knowing that the school where they may have received their "radio" training either as a civilian or as one of the many thousands of servicemen has now been closed and relocated.

This was the Radio School at the old Melbourne Technical College and now known as Royal Melbourne Institute of Technology Ltd. It was known as RAD School, Building 9.

The building was built in 1937 and was expanded during the war years (1943) and must have been a big improvement in assisting to cater for the many hundreds in training at that time.

Two people that many readers would remember were R. R. MacKay and Wing Commander James E. Reynolds and his parades in Bowen Street for the RAAF students. After the war, the RAAF continued to use RMIT facilities for radio training for their apprentices and several thousand more were trained right up to the middle 1970's when they used the facilities of the new Radschool at Laverton.

The new location of what is now the Telecommunications Division is 115 Queensberry Street, Carlton.

John R. Wales,
Head of Telecommunications Division,
Royal Melbourne Institute of Technology.

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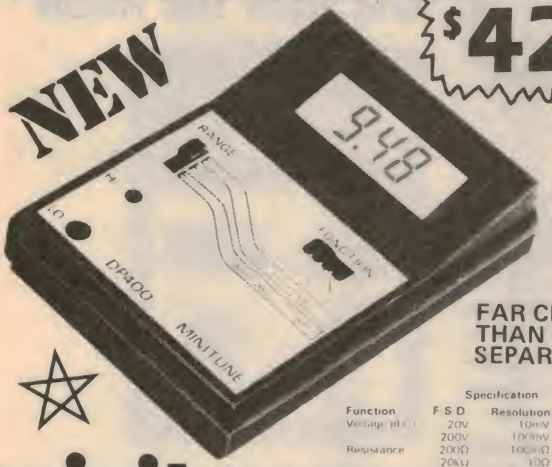

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Dwell	90°	0.1°	2% 3 digit

minitune

Following the spectacular success of the DP2010 Digital Multimeter kit, we now have an ENGINE ANALYSER KIT!
But the spectacular thing is the price! It is ACTUALLY CHEAPER than the DPM-05 Display and Case!!
The Minitune will measure voltage, resistance (down to a very low range), RPM and Dwell Angle.

Cat. KJ7012 MINITUNE KIT $42.95
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AT LAST! Jaycar now stocks 0.1" pitch P.C.B. Launchers.
You have seen these great little components on most imported computer equipment. They enable fast and reliable connection/disconnection to a P.C.B. Give your projects the professional finish that they deserve!
We stock these in 8 way (only). For smaller sizes simply cut down. The launchers will stack side-by-side without affecting the 0.1" pitch.

Cat. No.	Description	Price
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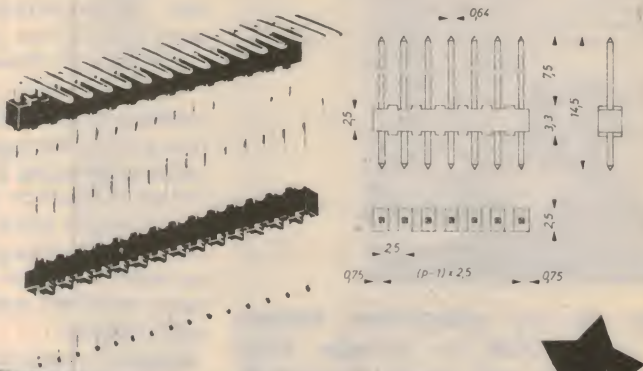
HM3220	0.1" pitch x 8 way connector socket	$2.95



Digital Delay Line KIT

ONLY $399 COMPLETE

The Digital Delay Line is designed to produce a huge variety of electronic effects. It works very well but the amazing thing is the low, low price!
The effects depend on the time delay selected and some of those included are: Phasing, Flanging, Chorus, ADT (Automatic Double Tracking), Echo, and Vibrato. The delay time can be varied from 0.32ms to 1.6 seconds! Because the signal is stored in digital form there is, unlike analog systems, no degeneration of the signal with time and unlimited repetition is provided by use of the Freeze control.
All the controls mount directly upon PCB's to eliminate wiring and to further simplify construction the main board is 'plated-through' i.e. there are no wire links or link-through pins. The whole of the memory whether for the basic 400ms machine or the fully expanded 1.6 second model all fits on the main board with all ICs in sockets for easy serviceability. The cabinet, which is free standing but also suitable for 19" rack mounting, is fully finished to a very high standard. The panel is deep blue whilst the cover is sprayed with a durable black enamel.
The (1.6 second) kit is available right now from Jaycar at only $399 – compare that with inferior units that can cost over $2,000!!

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But the bulk of the book still deals with those fundamentals that the newcomer needs to understand if he is to progress in his hobby. It starts off with a chapter, This is Amateur Radio, followed by (2) Fundamental of electronics; (3) Getting started; (4) Amateur radio equipment; (5) Communication receivers; (6) Transmitters; (7) The antenna; (8) Workshop practice; (9) Licence examinations; (10) Operating an amateur station; (11) The RSGB; (12) International organisations; plus an examination syllabus and sample exam questions as appendices.

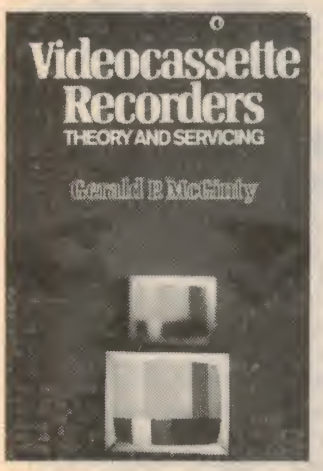
Naturally, some of the operating procedures, examination standards, etc, are based on UK requirements and should not be taken literally by the Australian reader. Even so, it is still useful background. On the other hand, the chapter on antennas contains a section, "SWR Facts and Fallacies" which should be compulsory reading for all amateurs, of all ages, in all countries.

All the chapters provide interesting and valuable reading, but three in particular, Fundamentals of electronics, Communication receivers, and Transmitters are recommended to the beginner as providing a very practical insight into modern circuit design.

Altogether a very comprehensive book, at a very modest price (even allowing for our devalued dollar) and one which we would thoroughly recommend to any prospective amateur.

Our copy came direct from the publishers. (P.G.W.)

VCR servicing



VIDEOCASSETTE RECORDERS: Theory and Servicing, by Gerald P. McGinty. Published by McGraw-Hill Book Company, USA, 1979. Soft covers, 255 pages, 134 x 203mm. Copiously illustrated with diagrams, waveforms, and photographs. ISBN 0 07 044988 0. Price $21.25.

A question frequently asked of this magazine is, "Is there a book which explains how video cassette recorders work?" – a question to which, until now, we have had no very satisfactory answer. Most books to date have dealt with video cassette recorders purely from the users point of view; what they will do, how to get the best out of them etc. The few which have purported to explain the technical mysteries have been woefully inadequate.

Happily, this book comes a lot closer to filling the gap. As the title implies, it is pitched at professional servicing level, and is therefore intended to be a practical handbook. But the title also includes the word "theory" and this gives a clue to the author's approach. (He is, incidentally, an engineering consultant and former assistant vice-president, engineering, of the Sony Corporation of America.)

According to the preface, he believes in first explaining how things work, then relating failure modes to this basic understanding, and finally explaining how the fault should be corrected. Significantly, most of each chapter is devoted to explaining the basic concept, and how the particular function is performed, with "troubleshooting" as the last sub-heading.

As one might expect, the author presupposes that the reader is familiar with electronics in general, and TV in particular, at least up to the video recording concept and needs only a brief recapitulation to refresh his memory.

The chapter headings give some idea of the contents. (1) Elements of Video Recording; (2) Colour-Under; Heterodyne Colour Processing; (3) Zero Guard-Band Systems; (4) Processing the Luminance Signal; (5) Colour Signal Processing; (6) Servo Systems; (7) Mechanical Aspects; (8) System Control; (9) Audio Systems; (10) Tuners and Modulators.

As a result of the author's attention to theoretical as well as practical basics, this book should serve both the practical service technician and the student who simply wants a good theoretical explanation of the video cassette recorder. It should at least provide a good starting point for either.

At the same time, the book does have its limitations. Some readers may find it a little heavy going in places, particularly if they are really starting from scratch in this field. This is not so much a criticism of the author's approach, but rather an acknowledgement that this is not an easy subject to cover fully in a book of this size.

Another point is the age of the book. Apparently published in 1979 it is now nearly four years old; a relatively long time in the video scene, during which a lot of things have happened. While these don't alter the basic concepts, they do influence the practical side.

Finally, for Australian readers, there is the fact that the book is based entirely on the American NTSC TV system so that most of the important figures quoted – line and frame frequencies, drum speeds, bandwidths etc – do not apply to the local scene. The reader would have to make due allowance for this.

But these limitations, provided they are appreciated, do not prevent it from being a very useful book which should at least put the reader on the right track to understanding the modern video cassette. In short, worthy of serious consideration.

Our review copy from Technical Book and Magazine Company Pty Ltd, 289 Swanston St, Melbourne, Vic, 3000. (P.G.W.)

Computer Basics

MICRO COOKBOOK Vol 1 by Don Lancaster. Published by Howard W. Sams & Co Inc, Indiana, USA 1982. Soft covers, 380 pages, 136 x 216mm, illustrated with diagrams and photographs. ISBN 0 672 21828 3. Price $24.75.

This book, subtitled "Fundamentals", is the first of a planned series by Don Lancaster, an author well known for his previous "cookbooks". In his own clear and light-hearted style the author explains the basics of microcomputer systems, beginning with a rather fanciful analogy between computers and a "conveyance" which can be instructed to become any type of vehicle.

From then on the emphasis is on hands-on work with training systems, cutting through the mystique of computers and leading the beginner step by step to an understanding of the principles of microcomputer operation and use.

Number systems, binary codes and memory devices are clearly explained in a way that makes learning fun and while the book is primarily intended for beginners many more experienced readers can profit by Lancaster's down-to-earth approach and advice on attitudes to learning, documentation and machine language.

Tips for users are picked out in text boxes headed "Things they never tell you in computer school" and important material is emphasised by cartoons and numerous line drawings. Playing games is encouraged as the best way to learn about computer operation and the accent throughout is on developing a solid understanding of principles.

In summary, an excellent book for the beginner, and worth a look by all microcomputer enthusiasts. Pity it costs so much.

Our copy supplied by the Technical Book and Magazine Company, 289 Swanston St, Melbourne, 3000. (P.V.)

totyping quantities within six weeks of order.

The chip provides four matched pairs of p-channel J-FETs, 176 small npn transistors and 16 matched npn devices in addition to four medium signal power (100mA) npn transistors and 64 pnp devices. Applications include the design of digital filters, audio circuits and one-chip data acquisition systems.

Exar products are distributed in Australia by Total Electronics. 9 Harker St, Burwood, Vic 3125. Phone (03) 288 4044.

Total Electronics has also announced a cross-licensing agreement between NEC of Japan and Standard Microsystems Corporation (SMC) of the United States which will make a selected range of second-sourced NEC components available through Total. The first four NEC devices to be made available from SMC are the uPD 765 Floppy Disk Controller, the 7220 Graphic Display Controller, 7210 GPIB controller and the 7261 Winchester hard disk controller.

Marconi Instruments RF signal generator

Since the introduction of the 2018/2019 range of Marconi Instruments AWA have taken orders for over 100 units. Two separate orders totalling 58 units have been placed by the RAAF after considering competitive tenders.

Both the 2019 and 2018 signal generators are microprocessor controlled instruments with the 2019 covering a frequency range of 80kHz to 1040MHz and the 2018 covering from 80kHz to 520MHz. They are the first of a range of new instruments intended primarily for radio communications applications and have been recently joined by the 2305 modulation meter.

Common features include LCD digital readouts of frequency, amplitude and modulation, an optional IEEE-488 bus interface and non-volatile memories which allow control settings to be retained while the instruments are switched off.

For further information contact the Instruments Department, Amalgamated Wireless (Australasia) Ltd, Cnr Talavera and Lane Cove Roads, Macquarie Park, North Ryde. NSW 2113.

6502 products: two for one offer

The Energy Control company of Queensland is currently making a unique offer in conjunction with Synertek Inc of California. Energy Control are distributors of the AIM-65 and SYM-1 single board computers and peripheral products, and are offering a "two for one" deal.

Simply put, if any product using the 6502 microprocessor can be upgraded to 2MHz operation Energy Control will offer 2MHz 6502A, 6522A, 6532A and 6551A parts – at the normal price of standard 1MHz parts.

For further information contact the company at PO Box 6502, Goodna, Qld 4300. Phone (07) 288 2757.

Microelectronics to make calculators

After nine years as sole Australian distributor of the Victor range of calculators, Microelectronic Pty Ltd is planning to become the first Australian company to produce its own house brand calculator to be marketed under the Microelectronic name.

The calculators will be produced in Japan to Microelectronic's specifications by manufacturers chosen because of their ability to meet the specific requirements of each model in the range.

Four years ago when many of the larger suppliers were moving out of the calculator market in favour of higher priced items the managing director of Microelectronics made the decision to stay with calculators and develop this area as a specialised market. "By remaining in the calculator market we have become unique in the industry devoted to calculators as a specialist company supporting a marketing, sales and service network Australia-wide," he said.

"We are simply providing an additional service for our customers in being able to conform exactly to their requirements."

For further information contact Microelectronic (Australia) Pty Ltd, 514 Miller PO Box 167, Cammeray, NSW 2062, Phone (02) 92 0837, or GPO Box 2024S, Melbourne, Vic 3000.

Anti-glare screens from Ordi-Flex

The Ordi-Flex anti-glare filter is said to reduce glare from the face of CRT screens by 95-100% and reduce reflected glare by up to 90%.

The anti-glare screen is constructed of nylon micro-monofilament fibres woven into a collimating grid pattern and is available in a variety of styles to suit over 70 different video terminals.

The screens are distributed in Australia by Technical Imports Australia, PO Box 176, Crows Nest, NSW 2065. Phone (02) 922 6833.

Integrated circuits for FM radio

Philips Electronic Materials & Components has announced the release of two new radio integrated circuits, the TDA1576 and TDA1578A.

The 1576 is an FM/IF amplifier and quadrature demodulator with a claimed sensitivity of 22μV for 3dB limiting and a signal plus-noise-to-noise ratio of 75dB for a 1mV input. Features of the device include a noise muting circuit and a signal strength output.

The TDA1578A is a phase-locked loop stereo multiplex decoder requiring a minimum of external components to provide stereo decoding, muting and a tuning indicator output.

A single FM channel from just two chips.

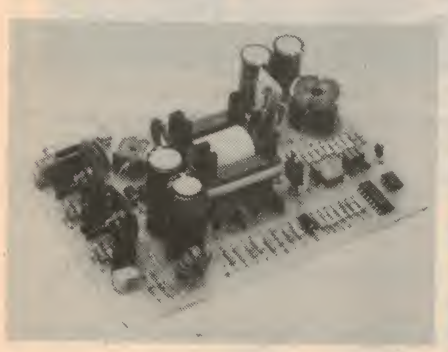
When both devices are used together the detune circuits in the TDA1576 drive a muting or DC-controlled mono/stereo blending circuit in the TDA1578A to provide a smooth transition from mono to stereo for weak signals.

For further information contact Philips Electronic Materials & Components, 67 Mars Rd, Lane Cove, NSW, (02) 427 0888.

New Products

Switch mode supplies from Scientific Electronics

A new range of single rail switchmode power supplies has been released by Scientific Electronics. Five models are available to suit microcomputer applications, with outputs ranging from 5V at 8A to 48V at 1A. Other voltages can be supplied on request.



Features of the series include 70% or greater efficiency, output voltage adjustment within ±10%, regulation of better than 2% for a 100% load change, and output ripple and noise of less than 2% peak-to-peak over a 0-20MHz range. As with all Scientific Electronics power supplies the new series carries a five year guarantee.

For further information contact Scientific Electronics, 6 Holloway Drive, Bayswater, Vic. (03) 762 5777.

Logic monitor tests digital circuits

Global Specialities Corporation has introduced a new logic monitor, the LM-2A, specifically designed to monitor 14-pin and 16-pin dual-in-line integrated circuits.

The new logic monitor has a built-in LED display which simultaneously indicates the static and dynamic logic states of the IC under test with connections made by a 16-pin "proto clip".

Using the optional LMA-9 cable up to 16 independent points in a circuit can also be monitored.

A front panel switch enables the user to select either TTL or CMOS logic threshold levels or a variable threshold between 1V and 9V by means of a thumbwheel switch.

All 16-signal inputs have an impedance of 1MΩ.

Global Specialities products are distributed in Australia by Vicom International Pty Ltd, 339 Pacific Highway, Crows Nest, NSW, 2065 (02) 436 2766 or 57 City Rd, South Melbourne, Vic, 3205.

Feedback-controlled soldering iron

Temperature control for soldering and desoldering tools is increasingly being recognised as essential for fine electronic assembly and various control methods have been used.

Power or voltage variation can be an imprecise method of controlling tip temperature, and mechanical switching also has limitations. According to Royston Electronics at least, the ideal solution is to have a heating element which is large enough to handle heavy demands but which operates only when the tip temperature drops below a preset level.

This is the method used in a new range of soldering and desoldering tools produced by Royston Electronics. The desired temperature is set on a direct reading dial and the heating element switches off when this temperature is reached, switching on again as the tip temperature falls. There are no switch contacts to burn or pit and no need to change a tip to alter the working temperature of the iron.

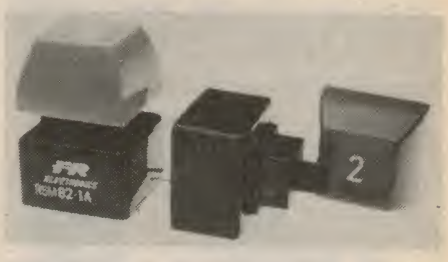
Full details of the new range of feed back controlled soldering equipment is available from Royston Electronics, 27 Normanby Rd, Notting Hill, Vic 3168, (03) 543 5122, or 15/69 Moxon Rd, Punchbowl, NSW 2196, (02) 709 5293.

New keyswitches from FR electronics

FR Electronics manufacture a range of keyswitch products using reed switches said to offer long life, high reliability, versatile mounting arrangements. The moving part of each key switch has four bearings designed to minimise lateral movement and provide smooth key action.

Both illuminated and non-illuminated switches are available in either single or double pole normally open types. Standard keycaps are in light grey with white characters but a full range of coloured keytops is available and alternative characters can be supplied on request.

FR Electronics also make a range of reed switches and a number of float switches for use as liquid level indicators.



Devices are available to suit most applications in fluid control and measurement, with the full range described in a new 16 page catalogue including information on materials, and mechanical and electrical specifications.

FR products are distributed in Australia by C & K Electronics (Australia) Pty Ltd, PO Box 229, Parramatta, NSW. Phone (02) 635 0799.

Enhanced Motorola voltage regulator range

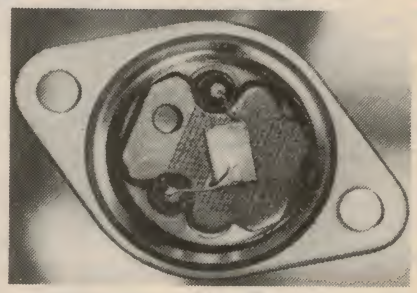
Motorola has introduced a series of three terminal negative voltage regulators capable of supplying more than 1.5A over an output voltage range adjustable from -1.2V to -37V. The new LM137/237/337 series requires only two external resistors to set the desired output voltage, and feature internal current limiting and thermal shutdown.

They are available in plastic TO-220 and metal TO-3 and TO-39 packages in three temperature ranges.

Also from Motorola are a range of fixed +5V regulators with output currents in excess of 3A and improved thermal regulation and ripple rejection.

The LM323 and 323A are available in low cost plastic TO-220 packages in addition to the metal TO-3 type pictured above.

Motorola has also introduced a new 80W +5V voltage regulator, the MPC100, which is capable of delivering 10A. Features of the device include CMOS feedback circuitry for



improved regulation, input/output differential voltage as low as 1.5V and internal thermal limiting, current limiting and short circuit protection.

In addition to the new range of voltage regulators Motorola has introduced a 25kVA Darlington power transistor specifically designed from motor control and heavy duty power supply applications.

Capable of dissipating up to 250W at currents of 100A, the devices are encapsulated in a new plastic package which is actually smaller than Motorola's previous 50kVA Darlington.

50 & 25 YEARS AGO

"Electronics Australia" is one of the longest running technical publications in the world. We started as "Wireless Weekly" in August 1922 and became "Radio and Hobbies in Australia" in April 1939. The title was changed to "Radio, Television and Hobbies" in February 1955 and finally, to "Electronics Australia" in April 1965. Below we feature some items from past issues.

Wireless Weekly

May 1933

Progress of Television: "Television in the United States," said Mr Scott (of the Scott Radio Laboratories, Chicago, USA, and who is currently visiting Sydney), "is a farce. I do not believe that any advancement in technique during the past 12 months has been made, and it does not appear that television will ever be brought to the necessary state of perfection to make ordinary radio receivers obsolete. Even if television becomes an accomplished fact, the broadcast receiver will be necessary for the sound, and the television equipment will be in the form of an accessory".

☆ ☆ ☆

New Circuit: The usual monthly meeting of the Institution of Radio Engineers of Australia was held at Science House, Grosvenor Street, on Monday, April 24.

It heard a short talk by Mr A. G. Hull, Technical Editor of "Wireless Weekly", on the subject of a novel and interesting circuit, with which he has been experimenting for the past couple of weeks.

Describing his circuit, Mr Hull said . . . he did not wish to claim that he had invented the circuit, but merely brought the circuit before the meeting on account of its interesting nature and possibilities. Mr Hull then went on to fully explain the operation of the circuit, and mentioned its many advantages over existing audio amplifiers.

(Editorial note: The circuit was that of a simple phase splitter, permitting push-pull operation without the need for a transformer. It was to become quite famous and remain popular until the end of the valve era.)

☆ ☆ ☆

Shades of things to come?: Japanese radio manufacturers are looking for foreign markets, and are going to sell sets in Singapore at from 35/- to £4 each, in competition with American sets at about £50 each, or with, shall we say, Australian sets at what price?

☆ ☆ ☆

Copyright problems: The English Postmaster-General told the English "Newspaper World" that he did not approve the connection of dictaphones to loud-speakers for taking down radio talks. But it is understood that there is no objection to listeners taking down talks in this manner, provided they make no public use of them.

RADIO TELEVISION AND HOBBIES

May 1958

Anti-gravity Research: A new international race going on behind the scientific scenes of Britain, Russia and America may yield a substance that falls upwards.

Recent discoveries in nuclear research indicate that the existence of such a substance is not as impossible as it sounds.

The first nation to produce it will almost certainly win the race into space, for a material which overcomes gravity will overcome the biggest problem facing rocket designers.

Since ancient times scientists have been aware of the laws of gravitation – the mutual attraction of masses toward each other.

But no one has ever been able to explain why it works.

But research work in nuclear physics has yielded sufficient intriguing facts to convince some scientists that they may be able not only to control gravity, but to reverse it.

One line of research into the problem follows up the field theory of relativity which Einstein was working on when he died.

The theory linked gravity closely with space and time. Now other scientists are examining the theory.

They hope that by transposing space-time values, they may produce new values of gravity.

In this fantastic search, success would mean a material with negative weight.

It could mean a spaceship which would leave the earth without so much as a child's cracker under it.

☆ ☆ ☆

Stereo Records: Progress towards the stereophonic disc is proceeding rapidly, and reports indicate that already records of this type are available in limited quantities in the USA. Major companies are planning for releases later this year, but even now equipment is coming on the market. The stereo future seems likely to be a major event.

Of special interest (is) the new stereo type record cutting head which, developed by Westrex in the USA, seems certain to be used for making the industry's newest contribution to the art of recorded sound.

It now seems quite certain that this type of head (45°-45°) will be used in preference to the vertical-lateral type, mainly because it is much easier to obtain good balance between the channels.

☆ ☆ ☆

Atomic power for NSW?: Atomic power stations would not be built in New South Wales for 10 years at least, according to Mr Conde, Electricity Commission Chairman.

Adequate supplies of relatively cheap black coal were available for the commission's thermal stations.

He added: "I cannot see where we will have a nuclear station for at least 10 years.

"It probably will be longer.

"Tremendous advances have been made in the field of commercial power from atomic energy."

Two separate timebase controls are provided on a dual concentric rotary switch, the outer for the A trace and the centre for the B trace. The sweep time is adjustable in 23 steps from 0.5s/div to 20ns/division in a 1-2-5 sequence. The B trace can be set to a faster timebase than the A trace to facilitate a closer observation of the waveform. This control is prevented from being set to a slower timebase than the A trace by a mechanical locking system.

The portion of the A trace shown expanded on the B trace can be indicated on the A trace by a brighter section of the waveform. The delay time between the start of triggering of the A waveform and the start of the B waveform is adjustable with the vernier Delay Time Multiplier from 0.2x to 10x the A sweep time per division. Vertical separation of the A and B traces is effected with the Trace Separation which is a dual concentric control incorporating the Holdoff.

The Holdoff control allows adjustment of the time between successive sweeps. This can be controlled to the extent that the hold off time can be 10x the normal value. The control is useful when displaying signals which jitter on the screen due to a noisy or jagged waveform edge on which the oscilloscope triggers. In slowing the successive time between sweeps, the effect is less noticeable.

Triggering for the A trace is selected by the five trigger source switch positions. In the V.MODE, triggering is determined by the vertical mode switches on the lefthand side of the screen. For the CH1 position, CH1 is the trigger source. Similarly for the CH2 position, CH2 is the trigger. In the ADD position, the sum is the trigger signal. When set to DUAL or QUAD, triggering is alternated between CH1 to CH4 provided that the ALTernating mode is selected. CHOP mode triggering is impossible since the trace will not be seen.

Other trigger selections can be CH1, CH2, 1/1 where CH3 is the external trigger and 1/10 where the CH3 trigger input is divided by 10. Trigger selection for the B trace is the same as the A trace with the exception that the V.MODE is deleted. In this case CH4 is the external trigger for the B trace.

Trigger coupling for the A channel can be either AC, DC, LFrej HFrej or Video. Synchronism to the video signal is frame if the timebase setting is between 0.5s and 0.1ms and line for settings between 50μs and 20ns. The B trace has similar coupling with the exception of video.

Three triggering modes are available. These are AUTO, NORMal and SINGLE. With the Automatic triggering the trace is present whether triggered or not. The Normal triggering will only display the trace when triggered. The Single triggering mode provides only one sweep until RESET when a further trace appears.

Whereas the CH3 and CH4 inputs are normally used as the external trigger inputs, these can be also used to provide extra traces, however, without the feature of a vertical sensitivity control. The vertical sensitivity control is fixed at 0.1V/div when the trigger control is set to 1/1 and 1V/div when the control is set to 1/10. The A and B traces are available on each.

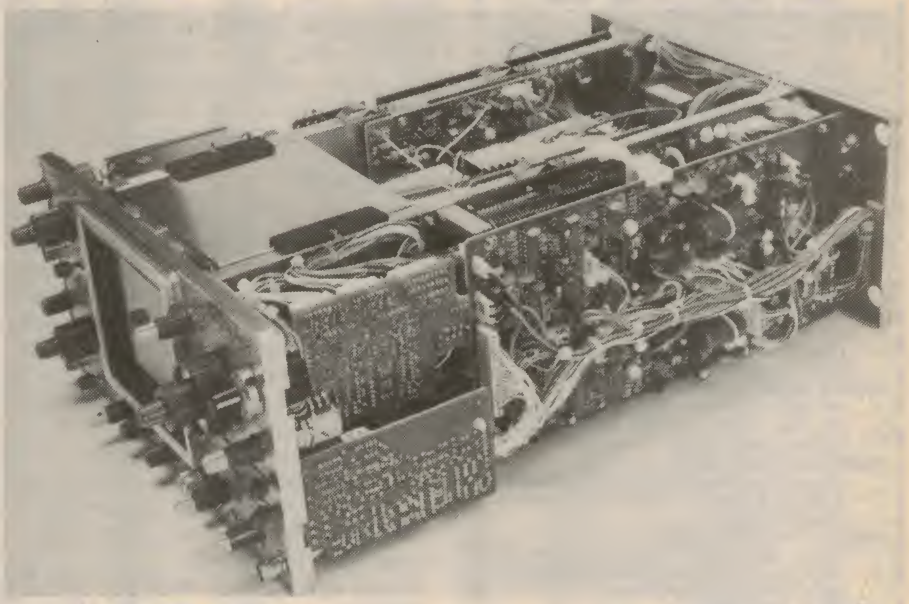
The Level/Slope control adjusts the signal slope point where triggering occurs. Both plus and minus levels can be triggered by rotating the Slope control. For the A trace pulling the Slope control out starts an auto FIX so that triggering always occurs at that slope setting. With the B trace, pulling the switch sets the triggering to occur after the delay set by the Delay Time Multiplier.

The Horizontal Display Mode switches select the type of display required. The A selection allows only the A trace to be shown, while the ALT selection displays both the A and B traces with the B sweep waveform intensified on the A trace. On A-INT-B only the A trace is visible but the B trace is intensified on the A trace. The B Dlyd displays only the B trace, while the DUAL displays both the A and B traces without the intensified B portion on the A trace. The X-Y selection allows Lissajous figures to be displayed.

The remainder of the front panel controls are: Focus; Scale Illumination; Beam Finder, which compresses the trace on the screen; Chop Frequency Select which is useful for altering the chop frequency when the original frequency is equal to the displayed frequency; A and B Intensity and the Calibration 1kHz square wave output.

Two rotary controls on the lefthand side of the oscilloscope are for adjusting the CH3 and CH4 vertical position. Controls at the base of the oscilloscope are for trace rotation and astigmatism. At the rear are the A and B gate signals (a sweep speed square wave), CH1 output and the Z-axis input for intensity modulation. By cascading the CH1 output to the CH2 input increased vertical sensitivity can be obtained.

Overall dimensions of the CS-2100A oscilloscope are 284 × 138 × 400mm W × H × D and the mass is 7.4kg. A large carry handle/tilting bail is supplied with the oscilloscope which has 15 degree detents. A panel cover is supplied which clips over the front panel and protects the controls from damage. Also supplied were two probe clips which are designed to clip onto the carry handle and support the probes when not in use.



Internally the CS-2100A shows compact construction and extensive cabling.

Two manuals are supplied with the CS-2100A. These are the handbook and the instruction manual. Together these provide sufficient information in order to operate the oscilloscope proficiently. Several examples of operation are given in the handbook which help the user quickly familiarise with the controls. The instruction manual provides application notes and examples of measurement on the oscilloscope screen. A brief circuit description is given, however, no circuit diagram is provided. A circuit flow chart is given instead.

For servicing, calibration and repair of the CS-2100, it will be necessary to ob-

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ACTIVE ELECTRONICS

4 KING STREET SANDRINGHAM VICTORIA
PHONE (03) 67 1137

SCR & TRIACS

SC151D	1 85
C103B	39
C106B	64
C106D	64
C122D	1 43
C122E	1 77

TRANSISTORS

AC126	66
AC127	45
AC128	86
AC187	58
AC188	98
AD149	1 39
AD161	1 54
AD162	1 55
AF127	98
BC107	29
BC108	27
BC109	29
BC177	30
BC178	31
BC179	31
BC212	20
BC318	11
BC327	11
BC328	11
BC338	11
BC546	11
BC547	11
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BC556	17
BC557	11
BC558	11
BC559	11
BC637	35
BC639	30
BC640	30
BCY70	40
BCY71	44
BD135	33
BD136	39
BD137	40
BD138	40
BD139	32
BD140	32
BD233	40
BD235	42
BD236	42
BD237	44
BD238	44
BD262	75
BD263	75
BD437	46
BD647	1 98
BD677	62
BD681	52
BD682	52
BDV64B	3 08
BDV65B	3 08
BDY96 (BUX 80)	3 10
BDY97 (BUX 80)	3 10
BF115	57
BF167	57
BF173	57
BF180	72
BF184	66
BF198	22
BF199	22
BF337	50
BF458	51
BF459	51
BF469	70
BF470	73
BF494	27
BFY50	53
BFY90	72
BU126	1 87
BU208	2 15
BU326	1 92
BUX80	3 18
MFE131	1 21
MJ413	3 40
MJ802	3 75
MJ1001	2 50
MJ15003	3 63
MJ15004	3 63
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MJ4035	7 60
MJ4502	4 07
MJE 340	75
MJE 350	82
MJE521	1 21
MJE 700	51
MJE 800	51
MJE 2955	1 92
MJE 3055	1 76
MPF121	1 37
MPF131	1 21
MPSA05	13
MPSA06	16
MPSA12	17
MPSA12	80
MPSA14	20
MPSA42	18
MPSA56	18
MPSA92	27
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MPF103	68
MPF105	68
MRF237	3 85
MRF454	29 00
MRF475	4 20
MRF646	35 00
MRF901	2 86
TIP31A	46
TIP31B	50
TIP31C	55
TIP32A	46
TIP32B	50
TIP32C	55
TIP41A	66
TIP41C	71
TIP42A	74
TIP42C	83
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TIP112	66
TIP116	77
TIP117	83
TIP120	66
TIP122	72
TIP125	77
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TIP3055	1 21
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2N3644	14
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2N3773	3 63
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2N5945	18 15
2N5946	20 35
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2N6126	66
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2N6274	21 90
3N201	1 43
2SJ49	6 11
2SK134	6 11
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7405	27
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7407	29
7408	25
7409	26
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7423	31
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7427	31
7430	21
7432	27
7437	29
7438	27
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7443	2 20
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7445	50
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7447	53
7448	1 05
7450	21
7451	22
7453	22
7454	22
7460	27
7470	38
7472	33
7473	33
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7475	42
7476	27
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7485	53
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7496	53
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74107	31
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74122	42
74123	38
74125	35
74126	42
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74145	39
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74148	1 10
74150	1 06
74151	40
74153	39
74154	1 07
74155	43
74156	74
74157	38
74160	94
74161	61
74162	1 06
74163	51
74164	51
74165	55
74166	66
74167	2 09
74174	50
74175	40
74176	99
74177	85
74180	35
74182	94
74184	3 30
74190	53
74191	66
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74193	53
74194	55
74195	46
74196	94
74197	55
74198	1 21
74199	1 43
74221	143
74251	1 21
74279	44
74283	66
74290	55
74293	83
74298	66
74365	75
74366	75
74367	75
74368	76
9300	44
9301	2 10
9302	99
9304	45
9307	1 21
9308	1 38
9309	46
9310	61
9311	1 21
9312	42
9313	4 95
9314	61
9316	61
9317	4 29
9318	99
9319	2 09
9320	4 40
9321	61
9322	40
9324	55
9328	1 10
9334	72
9338	88
9340	3 85
9342	5 39
9368	88
9374	3 25
9386	2 15
75107	88
75154	83
75450	77
75451	43
75452	43
75453	43
75461	49
75462	49
75491	53
75492	53
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8131	3 30
8303	1 43
8304	4 18
8820	1 54
8833	2 86
8836	1 32
1488	55
1489	55
81LS95	1 76
81LS96	1 76
81LS97	1 76
81LS98	1 76
8126	1 65
8T28	1 43
8T96	1 65
8T97	1 65
8080	5 95
8085	4 62
8086	65 00
8088	23 10
8155	4 24
8156	5 06
8185	31 90
8202	1 65
8203	52 00
8206	97 00
8212	1 65
8214	1 54
8216	1 43
8224	1 93
8226	1 45
8228	2 92
8231	218 00
8237	35 20
8238	6 16
8243	2 86
8251	3 85
8253	4 22
8255	2 97
8257	5 00
8259	3 90
8271	84 00
8272	24 20
8273	49 50
8274	33 00
8275	34 00
8276	20 90
8282	7 15
8283	6 93
8284	7 70
8286	6 38
8287	6 38
8288	19 80
8289	68 20
8291	31 90
8292	27 50
8293 10	29 15
8741	45 10
8748	28 60
8749	53 90
8755	28 60
2911	27 50
2912	18 70
2920	99 00
3205 8205	7 37
3242	17 60
3245	10 45
3628	28 60
8008	59 40
8031 3	32 50
8035	5 72
8039	5 94
FD1771	13 75
FD1791	27 50
FD1793	28 60
FD1795	28 60
FD1797	31 90
WD1691	14 85
WD2143	12 10
WD1931	21 50
WD1933	31 90
WD1983	10 75
WD1993	59 00
WD2123	26 40
WD8250	16 50
TR1602	6 50
TR1863	5 80
BR1941	9 90

74F SERIES

74F00	51
74F02	46
74F04	51
74F08	50
74F10	47
74F11	45
74F20	46
74F32	60
74F64	49
74F74	57
74F86	72
74F109	1 04
74F138	1 21
74F139	1 04
74F151	1 05
74F153	95
74F157	95
74F158	77
74F175	1 60
74F181	3 10
74F182	1 56
74F189	4 05
74F190	3 30
74F191	2 42
74F194	77
74F241	2 30
74F243	2 40
74F244	2 40
74F251	1 21
74F253	90
74F257	88
74F258	1 21
74F350	1 98
74F352	1 26
74F353	1 21
74F373	2 00
74F374	1 00
74F399	1 00
74F521	2 97
74F533	2 86
74F534	77

MEMORY

2102	99
2112	6 30
2114	1 65
2708	5 80
2716	3 96
2732	5 80
2764	10 70
4116	1 65
4164	7 10
6116	7 10
58725	6 60
5101	3 30
2532	6 60

OPTO

4N25	66
4N26	60
4N28	50
4N32	60
4N33	79
4N35	59
MCT6	1 21
MCT2	65
FND357	95
FND500	95
FND507	99
FND800	2 85
T1L31A	2 15
T1L81	1 76
BPW50	1 76
COY89	55
MOC3020	1 76
MOC3021	2 15

LEDS

3mm RED	11
3mm YELLOW	16
3mm GREEN	14
5mm RED	10
5mm GREEN	15
5mm YELLOW	15
RED RECT	22
GREEN RECT	22
YELLOW RECT	22
RED CHROME BEZEL	72
YELLOW CHROME BEZEL	72
GREEN CHROME BEZEL	72

VOLTAGE REGS

7805UC	50
7805KC	1 26
7812UC	50
7812KC	1 26
7815UC	50
7815KC	1 32
7818UC	53
7818KC	1 32
7824UC	53
7824KC	1 43
7905UC	61
7905KC	1 32
7912UC	61
7912KC	1 32
7915UC	61
7915KC	1 43
7918UC	61
7924UC	1 43
78L05	32
78L12	32
78L15	32
79L05	99
79L12	55
79L15	55
LM309K	1 27
LM317T	88
LM317K	2 31
LM323K	6 05
LM337T	1 76
LM337K	5 50
LM338K	6 38
LM350T	3 66
LM350K	5 06
LM396K	15 40
78H05K0	5 49
78H12KC	7 15
78HGKC	7 20
78P05KC	9 90
79HGKC	13 20
78S40	1 82
MC1496L	93

SPECIAL FUNCTION

LM4250	1 98
NE5534N	1 37
NE5534AN	1 65
MC3340	1 54
76477	3 95
76488	6 55
8038	5 75
OM350	7 15
XR2206	4 73
XR2207	3 74
XR2208	2 80
XR2209	3 05
XR2211	5 15
XR2216	2 20
XR2240	2 09
XR2242	1 98
XR2243	2 20
XR8038	3 85
ICC7660	4 15
95H90	5 25
11C90	10 40
LM7555	1 32
MC10116L	99
LF13741	59
LF13741 H	1 10
DS75451	39
DS75452	39
DS75491	52
DS75492	52
7216A	35 20
7216B	35 20
ADC0800	13 20
ADC0808	13 20
DAC0800	2 86
DAC0808	1 65
SAK140	86
4000	22
4001	22
4002	22
4006	66
4007	22
4008	61
4009	66
4010	53
4011	22
4012	24
4013	39
4014	77
4015	58
4016	39
4017	66
4018	72
4019	39
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4021	79
4022	58
4023	22
4024	43
4025	27
4026	99
4027	39
4028	73
4029	84
4030	42
4031	2 75
4033	1 65
4034	2 65
4035	77
4040	53
4041	88
4042	53
4043	68
4044	42
4046	88
4047	72
4048	50
4049	32
4050	39
4051	72
4052	88
4053	75
4055	1 98
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4082	22
4085	1 06
4086	40
4089	1 87
4093	40
4094	66
4099	1 08
4104	1 98
4160	72
4161	88
4163	94
4174	66
4175	66
4194	66
4409	4 73
4410	8 58
4411	9 20
4415	5 28
4419	2 97
MC14433	9 30
4435	4 28
4443	2 50
4458	6 30
4469	12 60
4490	3 96
4495	1 65
4500	4 40
4501	28
4502	74
4503	52
4504	84
4507	29
4508	1 04
4510	72
4511	72
4512	62
4513	1 25
4514	1 70
4515	1 98
4516	73
4518	73
4519	60
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4526	78
4527	78
4528	75
4529	1 00
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4531	86
4532	1 05
4534	4 95
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4543	73
4544	2 08
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4554	1 32
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4558	1 05
4560	2 05
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4568	2 20
4569	1 43
4572	46
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4581	2 30
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4583	94
4584	51
4585	73
4597	2 42
4599	3 30
45104	5 20
45106	6 36
45107	5 05

DIODES

1N4148	04
1N4001	05
1N4002	05
1N4004	06
1N4007	08
1N5408	17

74C SERIES

74C00	28
74C02	33
74C04	28
74C08	33
74C10	35
74C14	40
74C20	47
74C30	44
74C32	34
74C42	1 10
74C48	1 65
74C73	61
74C74	55
74C76	80
74C83	1 87
74C85	1 21
74C86	27
74C89	3 70
74C90	1 25
74C93	1 17
74C95	1 37
74C107	99
74C150	3 20
74C151	2 20
74C154	3 69
74C157	2 42
74C160	1 15
74C161	1 04
74C162	1 21
74C163	1 21
74C164	1 70
74C165	1 60
74C173	84
74C174	79
74C175	91
74C192	1 54
74C193	95
74C195	1 56
74C200	10 45
74C221	1 54
74C240	2 31
74C244	1 76
74C373	2 47
74C374	2 42
74C901	61
74C902	61
74C903	75
74C904	72
74C905	9 90
74C906	52
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74C908	1 32
74C910	11 00
74C911	9 90
74C912	9 90
74C914	2 03
74C915	1 70
74C917	9 90
74C918	1 65
74C920	4 95
74C921	4 95
74C922	5 28
74C923	4 95
74C925	6 60
74C926	6 15
74C927	5 50
74C928	6 60
74C929	3 85
74C930	3 85
74C932	1 31
74C941	2 09
74C989	7 70

74LS SERIES

74LS00	20
74LS01	27
74LS02	20
74LS03	20
74LS04	22
74LS05	24
74LS08	20
74LS09	23
74LS10	20
74LS11	22
74LS12	21
74LS13	25
74LS14	28
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74LS21	22
74LS22	23
74LS26	26
74LS27	22
74LS28	31
74LS30	22
74LS32	20
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74LS38	24
74LS40	23
74LS42	39
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74LS54	26
74LS55	26
74LS73	22
74LS74	26
74LS75	33
74LS76	35
74LS78	40
74LS83	40
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74LS86	23
74LS90	38
74LS92	45
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74LS95	40
74LS96	64
74LS107	35
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74LS113	38
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74LS273	77
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74LS367	44
74LS368	44
74LS373	77
74LS374	77
74LS375	44
74LS377	72
74LS378	50
74LS386	40
74LS390	69
74LS393	55
74LS447	50
74LS629	2 42
74LS640	1 48
74LS670	99

CPU

6502	8 69
6502A	9 36
6507	8 25
6520	2 75
6522	7 70
6522A	9 90
6532	9 90
6545	18 15
6551	13 20
6800	4 10
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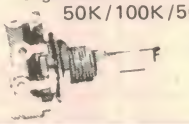

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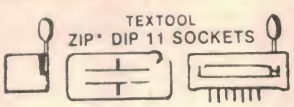

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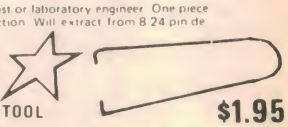

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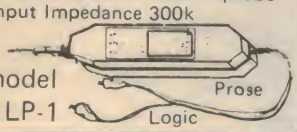

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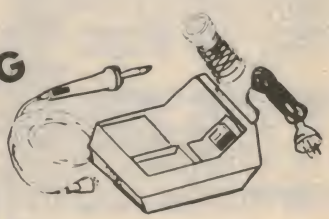

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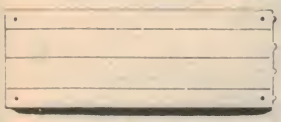

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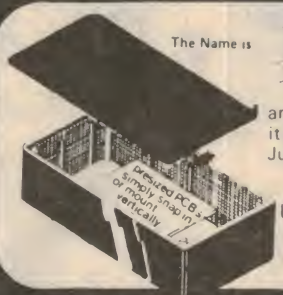

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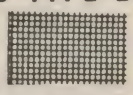

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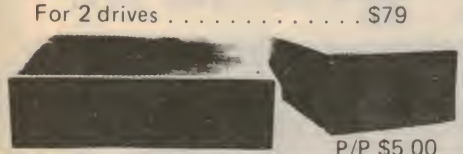

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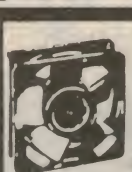

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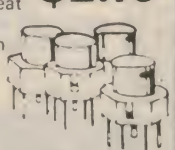

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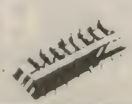

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Shortwave Scene

by Arthur Cushen, MBE

New frequency for the Falkland Islands

The Falkland Islands have been inaudible in Australia for several years, due to the low frequency of their transmission and an unsuitable schedule. More recently, they have introduced a new frequency, 3958kHz, and a breakfast show, which has resulted in good reception in the South Pacific.

The Falkland Islands Broadcasting Service previously operated on 2370kHz and the schedule was 2230-0130. This frequency was too low and the schedule unsuitable for reception in Australia. In April, 1982, when the Argentine invasion took place, Tony Marr of Wellington, NZ, reported reception of the station operating all night. Following the invasion, Radio Malvinas, under Argentine control, was heard occasionally on an extended schedule.

Since the Islands have returned to British control, the Falkland Islands Broadcasting Service has gradually extended its schedule and is now heard on 3958kHz opening at 0858UTC. Following short theme music the station announces that they are operating on 3958kHz shortwave and 96.5MHz FM. BBC news is relayed at 0900, followed by Review of the British Press and, at 0915, station identification, weather information, and commencement of the Breakfast Show. This includes popular music with frequent time announcements until fade out after 1000UTC.

SINGAPORE ON 6120kHz

Radio Singapore has been heard on a new frequency, 6120kHz, and this additional channel operates throughout the day 2200-1605UTC. Reception is best around 1300UTC and on Mondays there is a request music program up to 1400UTC. The best reception is on 11940kHz, which is often heard much earlier, at 1100UTC, when a news bulletin in English is broadcast, followed by commercial announcements. Two other frequencies, 5010 and 5052kHz, provide fair reception. It is presumed that 6120kHz will give good coverage throughout Singapore and Malaysia.

KIWI VOICE CONTINUES

In the March issue we advised that the Shortwave Service of Radio New Zealand would close on March 31. For the past year the Service had been funded by the Broadcasting Corporation of New Zealand and a recent meeting of BCNZ decided to continue the Shortwave Service as a relay of the national program. There is no information available as to any proposed expansion of the transmitting facilities which will continue on the old 7500W transmitters.

ENGLISH BROADCASTS

BELGIUM: Brussels provides good reception during our mid-day listening with a transmission 0030-0115UTC on 11625 and 15590kHz. A service to Europe 2100-2145 is on 6225 and 15590kHz, while broadcasts to Africa Monday to Friday 1400-1445 are now on 17915 and 21815kHz.

GERMANY: Deutsche Welle transmission in English to Australia 0930-1020UTC remains on 15275, 17780, 17800, 21540 and 21680kHz, and for morning reception in this area, 2100-2150 on 7130 and 9765kHz. There have been some new frequencies added, 15105 (0200-0400), and 9610 and 11955 (2000-2200).

ISRAEL: Jerusalem is using only one frequency to Australia for the English broadcast 0500-0515 and that is 9440kHz, but other channels, including 21710, provide good reception. The morning transmission to this area 2000-2030UTC is available on many channels including 9009, 9815, 11637, 11655 and 13745kHz.

NORWAY: Oslo has broadcasts to the South Pacific daily, with English for 30 minutes during the Sunday transmission. At 1000UTC 21735, 25615 and 25730kHz are used, and at 2000 the frequencies are 6010, 11850, 11870 and 15175kHz.

USSR: Radio Tashkent, Uzbekistan, is using new frequencies for their English broadcast at 1200 and 1400UTC. According to a recent schedule the programs are now on 5945, 5985, 9540, 9600 and 11785kHz.

UNITED NATIONS: The United Nations Radio broadcasts to the Asian and Pacific area in English from Tuesday to Friday at 1015UTC on 9565, 13860 and 15250kHz. The frequencies 9565 and 13860 operate from Delano, with the latter on lower SSB, while 15250 originates from the Philippines relay base. The transmission actually commences at 0945 in Chinese and at 1000UTC it is in Japanese.

NEW FREQUENCIES

AUSTRIA: Vienna broadcasts to Australia in English at 0430 and 0830UTC. A transmission at 0400-0600 is on 17745 and another at 0700-0900 is on 17740kHz. New frequencies have recently been in use and two of these, 17885kHz and 21490kHz, operate at 1000-1200.

MOROCCO: Radio Mediterrean International, broadcasting from Tangiers, has been noted on 5950kHz. In the past the transmission has been on medium-wave only, but the new shortwave service is well received at 0700UTC. It is a Government commercial station and has news in French at 0730.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill NZ. All times are UTC (GMT). Add eight hours for WAST, 10 hours for EAST and 12 hours for NZT.

REVIEWS OF RECENT

Records & Tapes

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YO-YO MA CELLO RECITAL: "Like a fiddle"

YO-YO MA – Cello Recital. A brilliant combination of the gay and the serious, much of it to be listened to in wonder. Patricia Zander (piano). CBS Digital Disc D37280.

Here is a platterful of fun, delights and wonders. Throughout the sleeve notes the legendary Paganini is constantly referred to as having peerless virtuosity on the violin and other stringed instruments unmatched by any other player before or since. Unfortunately, there is no way of comparing 18th century technique with today's although the many anecdotes surviving from the period are usually accepted as provideing adequate proof of the statement.

But, in addition to being a marvellous violinist, Paganini also acquired a reputation as a proven mountebank. For instance, players in those days used gut strings on their instruments and sometimes one of these broke during a performance – particularly embarrassing when it happened to a soloist in full flight!

It has been reliably established that Paganini would sometimes fray a string with a fingernail before a concert and ensure that it broke during one of the work's most difficult passages, whereupon Paganini would finish playing the work, apparently spontaneously, on the three remaining strings – to rapturous applause from the tricked audience. Paganini had, of course, rehearsed the work on three strings long before the concert!

Now I am not for a moment suggesting that the genial Yo-Yo Ma would indulge in such deceit. Aside I might add that, nowadays, unbreakable material is used in strings.

But I'd like to make it clear that I believe the legends of Paganini's skill, unmatched before or since. But I also believe that Yo-Yo Ma shows the same talent – without trickery – on the cello that his forerunner did on the fiddle. Indeed there are times when, in the upper register, Yo-Yo Ma, playing at

unbelievable speed, makes his cello sound more like a fiddle than a cello.

Here I must add that he can also, when necessary, make his instrument sound as grave or eloquent as could the late Pablo Casals himself.

He devotes Side 1 to what might best be described as cafe pieces, mostly transcriptions of pieces by Kreisler, Dvorak, even Chaminade, among the rest of the marvellously played kitch. But Side 2 is given to more serious stuff – five Paganini Caprices and Variations by different arrangers of original themes by Rossini and Paganini himself.

But, even at his most mischievous, he retains an unbreakable sense of style. And in all he does, whether wickedly tongue in cheek or serious to the point of dejection his accompanist on the piano never fails to match his mood – and sometimes what is more important – his speed. The sound is first class. (J.R.)

A ROSSINI OPERA — by other composers!

ROSSINI - A Turk in Italy. Opera incorporating the latest research into its authenticity. Montserrat Caballe, Samuel Ramey and others with the National Philharmonic Orchestra and Ambrosian Opera Chorus conducted by Riccardo Chailly. CBS Masterwork on three digitally recorded boxed discs. D3 37859.

Since his death in 1868 there has been so much contradictory information written about the mercurial Rossini that even the latest in the excellent brochure accompanying this opera admits the difficulty of separating the true from the false.

But it dispels once and for all the legend of the composer as a lazy fellow who wrote operas at amazing speed in bed and at an astonishingly early age. Further, that he had made enough money to retire to a gluttonous existence in Paris, writing an occasional page of music between fillet steaks crowned with fois gras – the famous Tournodos Rossini!

Rossini's apparent sloth was due to ill health. This is pointed out in the brief but excellent essay in the accompanying brochure by Philip Gossett, obviously the result of fresh evidence revealed by the latest research.

Il Turco in Italia is one of Rossini's least known operas. Paradoxically, it is a Rossini opera not by Rossini, since so much that was not his has been added to the original score and changes made to Rossini's own contribution, mostly by French musicians. Gossett states that, even today, in what has come to be regarded as the authentic score, there remains – with Rossini's approval – much work by other composers and early material included by Rossini himself. As such, it cannot strictly be regarded as a Rossini opera.

Yet the result is a sparkling entertainment as entirely acceptable as The Barber, Centerentola and An Italian Girl in Algiers. Incredibly it was Milanese objection to the last-mentioned title that caused them to deliberately neglect The Turk because, they alleged, Rossini was foisting on them a secondhand work.

However now with what may be regarded as near to the truth as we'll ever get the work is growing in popularity and is given frequent performances all over the world. And the recording under

Reviews in this section are by Julian Russell (J.R.), Neville Williams (W.N.W.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), Greg Swain (G.S.), and Danny Hooper (D.H.).

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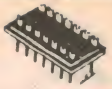

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- RI 810 8V @ 10A x 15V @ 1A $32.50
- RI 820 8V @ 20A 15V @ 1A 15V @ 3A $42.50

20 TURN CERMET TRIM POT
SPECTROL 43P ACTUAL SIZE

STOCK RESISTANCE VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M.

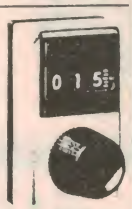
1—9	$1.90
10—99	$1.70
100	$1.40

Values may be mixed.

Hexadecimal Keypad $39.50

19-key pad includes 1-10 keys ABCDEF and 2 optional keys and a shift key.
Ideal for dream project

MULTIDIALS



Dials to suit 10 T Pots

Model 21 1.8" dia	$19.50
Model 16 9" dia	$14.50
Model 18 1" x 1.75" dia	$23.50

cermet single TURN TRIM POT
Spectrol model 63P ACTUAL SIZE

STOCK VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 200K, 500K, 1M, 2M.

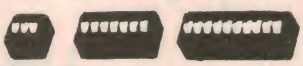
1—9	$1.20
10—99	$1.00
100	$0.90

Values may be mixed.

DIP SWITCHES SPST

P/N	No of Switches	Price
SD3	3	$1.60
SD4	4	1.70
SD5	5	1.90
SD6	6	2.30
SD7	7	2.40
SD8	8	2.50
SD9	9	2.70
SD10	10	3.00

DIP SWITCHES SPST



TEXTOOL ZIP* DIP 11 SOCKETS

16 Pin Zip* Dip 11	$11.50
24 Pin Zip* Dip 11	12.50
40 Pin Zip* Dip 11	17.50

*Zero Insertion Pressure

INCREDIBLE MEMORY AND DISC DRIVE PRICES

	1-9	10-25	25+
2708	4.90	4.00	3.90
2716	4.90	4.20	3.90
2732	8.00	7.50	7.00
4116 (200nS)	1.95	1.80	1.75
4164 64K Dynamic	11.00	10.00	9.50
M58725P (2K x 8) Static	10.00	9.00	8.50

(As used in new 64K Static S100 PCB)
ALL PRICES INCLUDE SALES TAX

MPI DISC DRIVES
(to suit Tandy & System 80 computers)
with Box & Power supplies

	1 DRIVE	2 DRIVES
B51	$295 + tax	$550 + tax
B52	$375 + tax	$725 + tax
B91	$460 + tax	P.O.A.
B92	$550 + tax	P.O.A.

CRYSTALS

	Cost
1MHz	9.50
1.8432MHz	7.50
2MHz	5.00
2.3040MHz	5.00
2.4576MHz	5.00
3MHz	4.90
3.5795MHz	3.00
4MHz	4.00
4.194304MHz	4.00
4.44MHz	4.00
4.75MHz	4.00
5MHz	4.00
5.0688MHz	4.00
6MHz	4.00
6.14MHz	4.00
6.6670MHz	4.00
8MHz	4.90
8.867238MHz	4.90
10MHz	4.90
11MHz	4.90
12MHz	4.90
14.31818MHz	4.90
15MHz	4.90
16MHz	4.90
18MHz	4.90
18.432MHz	4.90
20MHz	4.90
24MHz	4.90
27MHz	4.90
32MHz	4.90
36MHz	4.90
48MHz	4.90
100MHz	6.90

BIG BOARD (1) NEWS

Double Density add on.
$195 + tax (incl. Software & Hardware)

Hard Disc Interface $195 + tax

HEATSINKS

High Thermal Capacity Black Anodised

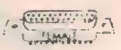
	1-4 $	5-9 $	10-49 $	50-99 $	100-499 $	500 plus $
HS1 — 38mm	1.85	1.75	1.50	1.35	1.00	0.90
HS2 — 75mm	3.00	2.90	2.50	2.00	2.00	1.50
HS3 — 150mm	5.80	5.40	4.90	3.80	2.90	2.70
HS4 — 225mm	8.10	7.60	7.10	5.90	4.50	4.30
HS5 — 300mm	8.90	8.40	7.90	6.50	4.90	4.60

Unanodised

HS11 — 38mm	1.40	1.20	1.00	0.90	0.80	0.70
HS12 — 75mm	2.50	2.20	1.90	1.60	1.25	1.20
HS13 — 150mm	4.90	4.50	4.00	3.20	2.45	2.40

RS232 & "D" TYPE CONNECTORS

PART NO	DESCRIPTION	1-9	10-25	25+
DE-9P	9 PIN MALE	$3.50	$3.50	$3.10
DE-9S	9 PIN F/MALE	4.50	4.20	3.90
DE-9C	9 PIN COVER	2.20	2.10	1.90
DA-15P	15 PIN MALE	4.50	4.20	3.90
DA-15S	15 PIN F/MALE	5.10	4.90	4.70
DA-15C	15 PIN COVER	2.30	2.10	2.00
DB-25P	25 PIN MALE	5.90	5.60	5.10
DB-25S	25 PIN F/MALE	6.90	6.60	6.10
DB-25C	1 pc Grey Hood	2.40	2.20	2.00
DB-25C2B	2 pc Black Hood	2.80	2.70	2.50
DB-25C2G	2 pc Grey Hood	2.70	2.50	2.40
DC-37P	37 PIN MALE	7.90	7.50	7.10
DC-37S	37 PIN F/MALE	10.90	9.90	9.10
DC-37C	37 PIN COVER	4.90	4.50	4.10
DH-S	Hardware set (2 Pairs)	2.10	1.90	1.80



BLANK CASSETTES T.D.K.

TDK ADC60	1 for $3.60	10 for $26.00
TDK DC60	1 for $2.10	10 for $18.00
TDK ODC60	1 for $3.50	10 for $31.00
TDK SAC60	1 for $3.50	10 for $31.00
TDK SAXC60	1 for $5.70	10 for $46.00
TDK DC90	1 for $2.40	10 for $21.00
TDK ADC 90	1 for $3.50	10 for $30.00
TDK SAC 90	1 for $4.20	10 for $39.00
TDK ODC90	1 for $4.70	10 for $45.00
TDK SAXC90	1 for $5.50	10 for $49.00
TDK DC120	1 for $4.50	10 for $37.00
TDK ADC120	1 for $5.40	10 for $46.50

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Ph: (03) 489 8131. Errors and omissions excepted

ROD IRVING ELECTRONICS

425 HIGH STREET, NORTHCOTE 3070, MELBOURNE, VICTORIA. Ph (03) 489 8131. Telex No. 38897
Most products also available at Ritronics Wholesale at 48-50 A'Beckett Street, Melbourne, right near R.M.I.T. (Please note prices will vary due to Sales Tax laws.)

tain the service manual which appears very comprehensive. A complete parts list is given as well as circuit diagrams and PC board overlay diagrams. Mechanical details of oscilloscope construction are also included. In addition, a trouble shooting flow chart is included to aid servicing.

The circuit of the CS-2100A is quite modern incorporating digital switching, differential amplifiers and a switch mode power supply. Isolation from the mains is provided by means of a converter transformer which also provides six separate outputs, each separately rectified. The feedback signal to the switching transistor from the transformer is via an optocoupler to ensure the isolation.

Internal construction is very compact with the PC boards mounted upright and secured by screws. There is considerable switch to PC board wiring and inter-PC board wiring and servicing of the oscilloscope would be quite difficult. Quality fibre glass double sided PC boards are used in most cases and sensitive circuitry is well shielded. Overall, the unit appears to be well constructed.

Bandwidth

Bandwidth is specified from DC to 100MHz at the −3dB point and is −3dB at 5Hz when AC coupling is selected. The input impedance is 1MΩ in parallel with 28pF. The 50Ω selection for input impedance also is in parallel with 28pF. Maximum input voltage is 500V p-p or 250V DC + AC peak for the 1MΩ input impedance and 5V RMS for 50Ω. Accuracy of the vertical sensitivity is ±3% while a similar accuracy is given for the timebase. Display jitter is specified as 1/20,000 of the full scale sweep time; a remarkable result.

In use and when observing a 100MHz waveform we were able to obtain a clean and well triggered trace. With full brightness we were able to see the trace flyback on the screen but at normal brightness this was not evident. At lower frequencies the oscilloscope performed well and could trigger easily on complex waveforms.

Two features we did not like were the use of a pushbutton for the 50Ω/1MΩ input impedance selection switch. This is not the illuminated type and as such it is very difficult to see at a glance whether the 50Ω impedance has been selected. The other feature was evident when observing the intensified B trace portion on the A trace. We found this to be excessively bright, even when the intensity of the A trace was reduced to a minimum. There is no separate intensity adjustment for this intensified portion.

Apart from these complaints, overall the oscilloscope performs very well. Most of all we liked the easy-to-use controls, the illuminated switches and LED indicators, particularly the triggering LEDs. The beam finder facility was found to be very useful since it helps ensure that the trace is on-screen before any further attempt is made to locate the trace with other controls. A minor but useful feature is the incorporation of 10% and 90% deflection graduations on the screen.

One final point regards the use of digital circuitry to select connections as indicated by the illuminated switches. A small lithium battery is used to power the "memory" of the digital circuit when the mains power is off. This allows the user to switch off the unit and return to find the oscilloscope at the same settings after switching on again. The price for this facility is that the battery will need to be replaced possibly every few years.

Also supplied with the oscilloscope were two Greenpar 88100 100MHz probes. These are of English make and have a capacitance of 12pF. A switch on the probe body allows selection of 1:1, REF and 10:1 inputs. The 160mm long earth lead is detachable by unscrewing from the probe body. For normal low frequency use we found these to be too short, however longer earth leads are available. Other supplied options with the probes are: a retractable hook, IC test tip, tip insulator, BNC adapter and trimming tool. In general the probes are of high quality. One of the probes supplied to us though was faulty, having a loose switch within the probe body which led to misleading readings of the switch position.

In conclusion

Overall, the CS-2100A represents a good quality high performance oscilloscope, with many useful features. The extra two channels available from the external trigger inputs are very useful when checking digital circuitry where the lack of vertical sensitivity control is not important. The CRO should be a valuable addition to a well equipped laboratory and workshop for general purpose use and for analysis of high speed digital and analog signals.

For further information on both the TRIO CS-2100A oscilloscope and Greenpar probes, contact Parameters Pty Ltd, 41 Herbert St, Artarmon, NSW. Phone 439 3288. Telex AA 25021. Recommended retail price of the CS-2100A is $2495 ex. tax. The price incuding tax is $2844. Probes are available separately for $30 each or $34.50 including tax. (J.C.)

The Trio CS-2100A 100MHz oscilloscope

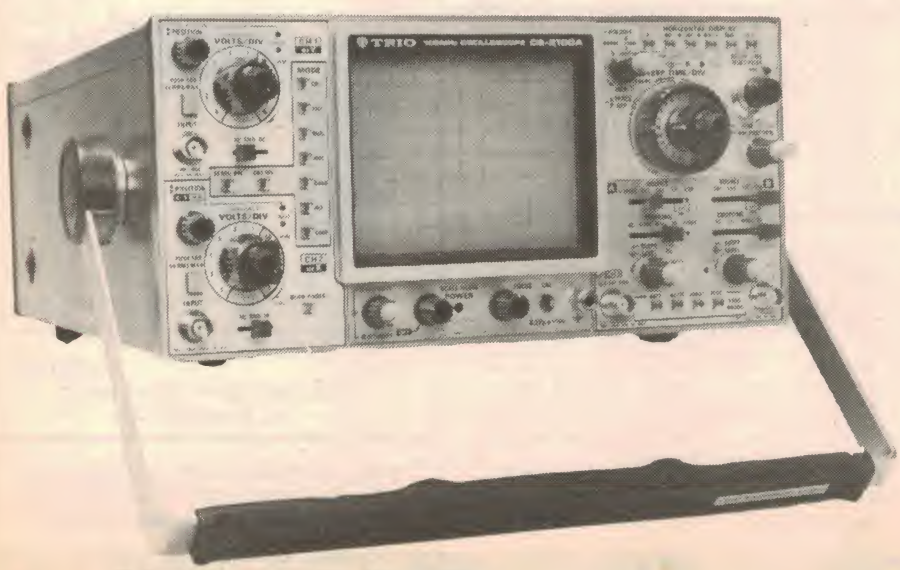
This versatile and compact oscilloscope from Trio-Kenwood of Japan has two channels which can each display an A and B trace on independent timebases. In addition the two external trigger inputs for the A and B traces can be used to provide four channels in all and a capability to display eight traces at the one time. A delay triggering facility is provided on the B trace. The maximum sweep speed is 2ns/division while the maximum sensitivity on channels 1 and 2 is 1mV/division.

With modern high speed digital and RF circuitry, the need for a wide bandwidth oscilloscope becomes mandatory. Viewing of digital signals for glitches and timing problems can easily be seen on a 100MHz oscilloscope. Again, when viewing complex waveforms such as video signals or high frequency RF signals, the triggering facilities of a 100MHz oscilloscope enable a clean trace of the waveform on the screen. The TRIO CS-2100A is a modern 100MHz oscilloscope with some advanced features suitable for the above applications.

The CS-2100A is a single gun Cathode Ray Oscilloscope which displays many traces at the one time by using chopping and alternating techniques to rapidly switch the beam from one trace to another.

Two vertical sensitivity controls are available one each for the two main channels, CH1 and CH2. Each channel can display two traces, A and B which are separately controlled with the timebase. This allows four traces to be displayed at the one time, the A traces of CH1 and CH2 being controlled by one timebase and the B traces of CH1 and CH2 controlled by the second timebase. In addition, the B trace can be delayed to display the waveform at a preset time after the A trace has triggered.

Two further channels are available, CH3 and CH4, which are normally used as the external trigger inputs of the A and B channels respectively. Again these display with both the A and B channels. With all channels selected up to eight traces can be displayed. Note, however, that CH3 and CH4 have only two sensitivity settings at 0.1V/division and IV/division.



As must be expected with an oscilloscope of this complexity, the control panel has an abundance of knobs and switches although these have been arranged to simplify operation.

Commonly used controls, such as the vertical sensitivity, position and timebase controls are well spread apart and in convenient locations. In addition the front panel artwork is colour coded into sections which group the switches as to their control functions.

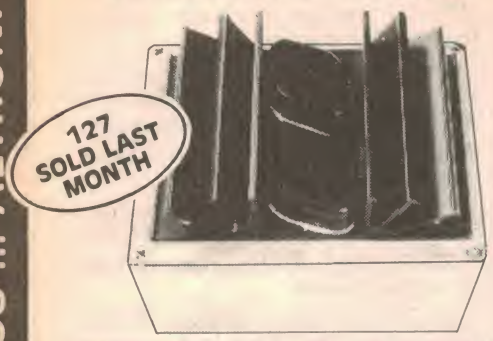
Considerable use is made of back-lit switches which glow when selected. These consist of transparent plastic buttons with a red LED behind each one. They aid considerably when operating the oscilloscope since the selected switch can be immediately seen. LEDs are used also to indicate power, triggering, for uncalibrated timebase and sensitivity positions and when the vertical sensitivity is in the x5 position.

Channel 1 and Channel 2 each have a set of input controls. These are the vertical sensitivity (V/division), vertical position, 50Ω/1MΩ input impedance selection and input coupling (AC, DC, GND).

Vertical sensitivity for both CH1 and CH2 (pull-out knob) is switchable in 10 steps from 5mV to 5V/division. The x5 gain control increases sensitivity to 1mV/division. A variable calibration control allows a reduction of sensitivity from the calibration position.

The MODE control switches allow the selection of CH1, CH2, DUAL (both CH1 and CH2), ADD (the addition of CH1 and CH2) and QUAD (display of CH1 to CH4). In addition when either DUAL or QUAD is selected, ALTernating or CHOP modes can be selected. The two remaining switches are for CH2 inversion and for 20MHz bandwidth selection which eliminates higher frequency components on the screen.

TRANSISTOR ASSISTED IGNITION WITH DWELL EXTENSION



The Altronics Kit includes all components for the modifications, detailed by Electronics Australia Feb. 1983.

Yes, it's bad enough paying $2.00 a gallon for petrol without wasting a fortune on an out of tune engine. Fit this transistor assisted ignition kit in minutes and start saving money from the very next petrol stop. Easy to build!

K 4010 . . . . . **$35.00**

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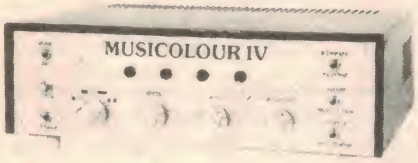

Combination Colour Organ and Light Chaser. Four channel colour organ. Internal microphone or connect to speakers for colour organ operation. (The lights connected to each channel pulse in beat to the music proportional to portion of frequency spectrum concerned.) Four chaser modes forward and reverse. Output lamp load capacity a massive 2400 watts — that's 100 party globes. Full instructions and every last nut and bolt included. Great for parties, shop signs, display windows etc.

K5800. . . . . **$89.50**

ELECTRONIC FLUORO STARTER

(SEE EA OCT 1982)

Save a fortune on Flouro Tubes

- ★ Extends the life of your flouro tubes by 1,000's of hours
- ★ Instant "ON" — no more flickering at switch on

K6300 . . . . . **$4.95**

HIGH FIDELITY AM

Sounds every bit as good as FM
With this absolutely brilliant
EA Project

Project 82 AR12 See December EA

Frankly, we felt AM was dead and buried for the serious audio buff — when EA told us their new wide band AM tuner had 16KHz bandwidth and made AM sound like as never before — we were still not convinced. But on hearing the New EA AM Tuner, it for one was astonished — AM Broadcasts now sound incredible, there is no other word for it. **And the 9KHz whistle filter really works!** The result is clear smooth sound reproduction that will be a joy to every constructor of this fantastic tuner project.

The ALTRONICS Kit includes rack box and every last nut and bolt — even solder. Full instructions included.

K 5200 . . . . . **$249.00**

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SERIES 5000 1/3 OCTAVE GRAPHIC EQUALIZER

Another brilliant DAVID TILBROOK no compromise design

SPECIFICATIONS:
Noise — at zero gain and 20 KHZ Bandwidth — 102 db. **Distortion 1 KHZ** — typically .007%. **Bandwidth** — 12HZ — 105 KHZ + 0 — 1 db. **Boost/Cut** + and — 14 db.

ALTRONICS EXCLUSIVES:
★ All 1C sockets provided ★ Quality series Racking Case supplied ★ Genuine Philips Sygnetics Low Noise 5534 1C op amps supplied * Specially imported high accuracy linear slide potentiometers employed for precision control adjustment. (**NOTE:** Not compromise "Null Centre" types that some suppliers offer.)

K 5025 . . . . . See ETI Magazine November 1982 . . . . . **$199.50**

STUDIO FORMAT ETI 5000 STEREO CONTROL PREAMPLIFIER

There have been countless accolades exclaiming this brilliant design by Australia's top audio design engineer David Tilbrook — and with good reason!

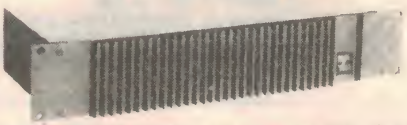
As a demonstration of our faith in this classic designed preamplifier we proudly release the **STUDIO FORMAT 5000 PREAMP** which includes some very worthwhile refinements as detailed here:—
★ Gold plated RCA Jacks on all phono inputs ★ 1 x pair gold plated RCA Line Plugs, supplied ★ Military spec. National Semiconductor LM 394's employed ★ Low capacitance screened cable, supplied; 1C sockets provided throughout; Multicoloured led display ★ Metal film 1% resistors used throughout all audio circuitry ★ Pretinned PCB's ★ Satin Black brush finished, aluminium control knobs

DELUXE STUDIO FORMAT 5000 PREAMP KIT Complete kit includes all ETI specified parts plus the Studio Format Package. Full instruction booklet included. SEE ETI MAG. JULY '81—OCT. '81 FOR FULL DETAILS.

K 5001 . . . . . **$275.00**

ETI 5000 STEREO MOSFET AMPLIFIER

See ETI magazine Jan. '81—April '81. New generation mosfet power semis facilitate David Tilbrook's classic power amplifier. Listening tests prove it surpasses even the best in conventional amplifiers in low fatique, high definition audio. Completely uncoloured crisp sound purity.



EVEN BETTER: This beautifully engineered amp design is based principally on two identical printed circuit boards with a minimum of other wiring, thus enabling even a relative "beginner" to accomplish building this project as long as the step by step instructions are followed.

The ALTRONICS Kit includes the DELUXE FINISH FRONT PANEL HEATSINK

★ Original specified chassis bar design case ★ All metal work finished satin black ★ Flux shorting strap transformers used to minimise hum ★ Low leakage power supply electrolytics

SPECIFICATIONS: Power Output: 100 watts into 8 ohms x 2. **Frequency Response:** 8 HZ - 20 KHZ + 0 db — .4 db. **Noise:** 116 db below full output. **Input sensitivity:** 1V RMS for 100 W output. **Distortion:** Less than .001% at 1 KHZ and full output. **Stability:** Unconditional stable.

COMPLETE MOSFET AMP KIT K 5005 . . . . . **$299.00**

LOUDSPEAKER PROTECTION KIT

Protect your valuable loudspeaker system with this easy to build, professional appearance kit. This easy to construct kit, based on the latest ETI design (Oct. '82), provides both DC and overpower protection for your valuable Hi-Fi speakers.

Self-powered unit disconnects the speakers within 1/10th of a second of a fault occuring yet in no way effects the sound quality.

The ALTRONICS Kit comes in a superb 1 unit rack box including quality silk screened front panel.

EXCLUSIVES: ★ LED Monitoring of channel cutout ★ Fujitsu 10 amp relays ★ ALTRONICS Kit, stereo unit complete to last nut bolt and washer ★ Input/Output speaker cable terminals supplied.

Install it in minutes — no AC or DC connections required — simply connects into the left and right channel speaker lines.

K 5050 Stereo Rack Version **$79.50**

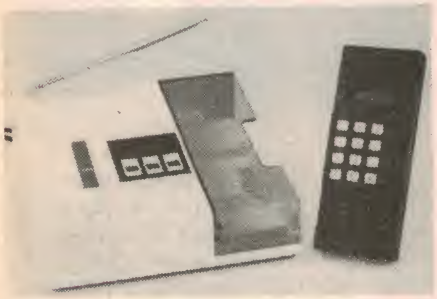
2-18MHz amateur antennas from Traeger

Traeger Distributors (NSW) Pty Ltd has been appointed the sole Australian agent for Butternut Electronics Co of Texas, the manufacturers of the HSV-6 vertical all-band amateur antenna. Traeger will also handle commercial antennas to the basic HSV-6 design, specified for frequency ranges from 2-18MHz.

For further information contact Traeger Distributors, PO Box 348, Moree, NSW 2400.

Tandy Electronics portable telephone

Tandy's answer to that "phone-bound" feeling is a new "Porta-Phone" which allows use of the telephone up to 150 metres from the connection point.



The Porta-Phone consists of two units, a mains-powered base and a portable phone which is said to be small enough to fit into a shirt pocket. When a call is sent or received the two units are linked by a transceiver in the base.

The portable unit accepts incoming calls and allows pushbutton dialling for outgoing calls. It will also store the last number dialled and re-dial it at the touch of a button.

The base unit contains a battery charger which recharges the battery of the handset every time it is placed in the cradle.

Retail price of the unit is $299.95. For further information contact your nearest Tandy Electronics store.

Remote control switching for household use

A household remote control appliance switching unit from the English company Home Automation Ltd is now available from their Australian agents, Lighting Energy Systems.

The Ripul system uses existing household wiring to send signals to control lights and appliances. Control signals are sent from a hand-held infrared transmitter to a sender unit plugged into a mains socket and passed along the wiring to receiver units which are either wired into the mains or plugged into a socket to control the light or appliance to be operated.

The hand-held transmitter has 16 channels for switching appliances or dimming lights according to the type of receiver. Each receiver has an adjustable address from one to 16 and can be selectively activated by sending a signal to the corresponding address.

A programmable timer is also available, able to control up to four of the channels in any pattern of on/off switching. Each address panel has up to 20 programmable time functions and can be programmed on a daily or weekly basis. Timing resolution is to the nearest minute and channels can be used for switching on radio or television recording equipment or lights and other appliances up to one week ahead.

The remote control unit is said to be able to be interfaced with any computer system, and larger units are available for industrial applications, including the switching of air conditioners, heaters and lighting.

For further information contact Lighting Energy Systems, 1 Leighton Place, Hornsby, NSW 2077.

Tools for electronics from Dick Smith

Dick Smith Electronics currently has available a new range of four stainless steel pliers including long nose, needle nose and flat nose types, at prices said to be much less than comparable stainless steel tools.

The full range is available from all Dick Smith Electronics stores at $7.75 each.

Low cost VHF marine transceiver

A new VHF marine transceiver from Dick Smith Electronics is claimed to be one of the lowest-priced units available. Features of the unit include built-in coverage of the 55 international channels in the 156-163MHz marine band, Department of Communications approval (No. 274B033), power output of 25W (the maximum permissible) and OTC approval for use with the Commission's "Seaphone" service, which enables link up with the telephone network.

The transceiver, catalog number D-1401, retails for $399 and is available from Dick Smith stores throughout Australia.

Warburton-Franki test equipment

Warburton-Franki has introduced a new low distortion oscillator, the Krohn-Hite Model 4400A. The oscillator provides a sine wave output covering the frequency range from 1Hz to 110kHz with distortion of less than .001%. Frequency selection is via five decade multiplier pushbuttons and two calibrated vernier dials providing continuous coverage over the full range.

The unit provides both 600Ω and 50Ω outputs at a maximum level of 7V RMS. Four calibrated 20dB attentuation steps can be switched in by pushbuttons on the front panel and a 30dB vernier provides fine adjustments. Amplitude and frequency stability is claimed to vary by less than .001% for a 10% change in line voltage.

Also available from Warburton-Franki is a new series of DC/DC power modules from Stevens-Arnold of the United States. The 30W "WR" series uses a 50kHz switching regulator which is claimed to be 80% efficient at loads of as little as 30% of full capacity.

Dimensions of the unit are 65 x 115 x 21mm, in a shielded enclosure.

Full specifications can be obtained from your local Warburton Franki office or the head office at 372 Eastern Valley Way, Chatswood, NSW, 2067.

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Dick Smith and Staff

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Telephone orders: (02) 888 3200

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New Products...

Product reviews, releases & services

Latest game has a built-in video display

Milton Bradley's new home video game system, Vectrex, uses a vector graphics display and is said to be the only video game unit on the market which is independent of the home television set.

Vectrex uses a vector scan video display rather than the raster scan system used by television sets and incorporates its own 23cm high video monitor. Claimed advantages of vector display systems include finer points and faster line drawing. The principal disadvantage is that colour systems are much more expensive and accordingly the Vectrex uses a monochrome display with coloured plastic screen overlays for each game.

The Vectrex system consists of the screen with a resident games cartridge and a controller with proportional joystick and four control buttons. Sound effects including music, explosions and crowd sounds are produced by a General Instrument AY38912 sound generator chip and the unit is controlled by a Motorola 6809 microprocessor.

So far some 13 games cartridges have been made available for the system including "Armour Attack", "Space Wars" and others that will be familiar to arcade game players.

The Vectrex unit is priced at "under $300" and will shortly be available at major department stores throughout Australia.

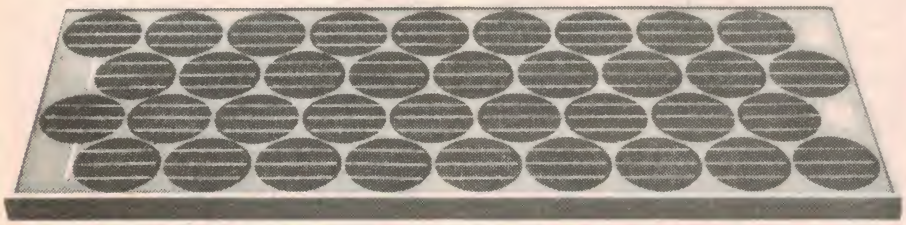
Also from Milton Bradley is a new computer chess game called the "Phantom" because the chess pieces move independently in response to a move by the human player.

Twelve levels of play are available from beginner to international tournament level, with each skill level increasing the time taken for the computer to calculate its move. The human player can reverse the action of the game to return to an earlier position or to study the development of a game, and a "hint" function is also provided in which the computer will indicate strong moves based on the opponent's present position.

For the beginners there is an "illegal move" indicator, and the computer chess game can also be made to play against itself at any of the 12 levels of difficulty. Two human players can also use the board and chessmen, in which case the computer will store the moves made by each side so that the game can be replayed at any time.

For details of these and other Milton Bradley products contact the company at 9 Sydney Gate, Waterloo, NSW 2017.

Solar panel uses world's largest silicon cell



A new solar panel from Photowatt International uses what is claimed to be the world's largest silicon photovoltaic cells, 127mm in diameter.

The Photowatt ML7010 55W solar panel uses 36 of the cells connected in series and encapsulated in an aluminium frame with a tempered glass cover. Peak power output is quoted as 16.5V at 3.3 amps.

Dimensions of the unit are 125.7 × 49.5 × 3.8cm (length × width × height) and weight is given as 8.6kg.

The modules have been tested to ensure resistance to hailstorms, mechanical stresses, and temperature and humidity cycling. One test specifies the solar cell module as proof against hail stones of up to 3.2cm diameter, and each unit carries a two year guarantee.

Typical applications include remote communications stations, offshore platforms and boats, irrigation installations, navigation aids and portable equipment.

The Photowatt modules are distributed in Australia by Amtex Electronics, PO Box 285, Chatswood, NSW 2067. Phone (02) 411 1323.

Exar, SMC chips from Total Electronics

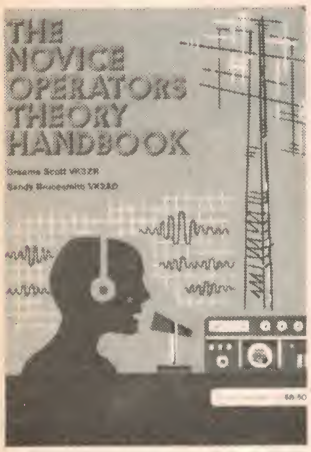
A new precision waveform generator chip from Exar provides separate sine, triangle and square wave outputs at frequencies from .001Hz to 1MHz. Distortion is quoted as typically 0.5% and the linearity of triangular, sawtooth and ramp voltages as 0.1% or better.

Output frequencies are programmed by selecting appropriate R-C components and is virtually independent of supply voltage. All waveforms are available simultaneously from separate outputs and frequency, sweep and modulation can be controlled by applying voltages to the appropriate inputs.

Also from Exar Integrated Systems is the new XR-1 XR-W100 bipolar FET master chip, a semi-custom integrated circuit which contains a mixture of bipolar and junction field effect transistors and passive components. Devices can be configured and shipped in pro-

Books & Literature

For the prospective radio amateur



THE NOVICE OPERATORS THEORY HANDBOOK by Graeme Scott (VK3ZR) and Sandy Brucesmith (VK2AD). Published by K. Bigger Locum Advertising, North Sydney, NSW. Soft covers, 205 x 280mm, 80 pages. Illustrated with many circuit diagrams. ISBN 0 9593726 0 1. Price $6.50.

This book is aimed at those who aspire to pass the Novice Amateur Operator's Certificate of Proficiency (NAOCP), needed to obtain a Novice Amateur Operator's Licence. The basic concept is a book which contains all the information needed to study for this exam, condensed to bare essentials, and isolated from irrelevant material which frequently hampers the student when trying to extract the essentials from broader texts.

As a further aid to the student, each chapter is terminated in an examination, multiple choice style, based on that chapter and at about the level likely to be encountered in the official examination. The student is advised to study each chapter, answer the exam questions, then check these against a table at the back of the book.

There is no doubt that the authors have managed to pack a vast amount of information into one book. The first chapter, alone, for example, covering some 16 pages, starts with atomic theory and finishes with decibels, having covered DC and AC theory, Ohm's Law, inductance, capacitance, resonance (tuned circuits), transformers etc on the way!

Having acquired this groundwork, the reader moves on to chapter 2, Vacuum tubes; (3) Semiconductors; (4) Power supplies; (5) HF transmitters; (6) Morse transmitters; (7) AM transmitters; (8) SSB transmitters; (9) Receivers; (10) Propagation; (11) Transmission lines; (12) Antennas; (13) Interference; (14) Test equipment; (15) Circuit symbols; (16) Morse code; and (17) Answers to questions.

There are those who may question whether it is possible to condense all this into a mere 80 pages, even large ones, without defeating the original objective. In fact, the authors appear to have done a particularly good job and, if the student is keen enough, he should be able to find the answers to most of his questions, either self inspired or at the end of each chapter.

Granted, some students may find that such a condensed text, alone, is not adequate, but it should prove invaluable as a guide when studying more detailed texts. Again, it should be a most useful reference to those studying in club organised classes, where instructors can expand any particular subject which the student finds difficult.

Unfortunately, we did find a few statements open to query, particularly in the chapter on transmission lines. These include the implication that typical transmitters, intended to work into a 50Ω load, present a source impedance of 50Ω, or that this is important anyway. Equally questionable is the suggestion that, in the event of an open circuit or short circuit at the load (antenna) end of the line, it is the standing waves which present a risk to an unprotected transmitter. (A short or open circuit would be at least as dangerous if they occurred right at the transmitter terminals.)

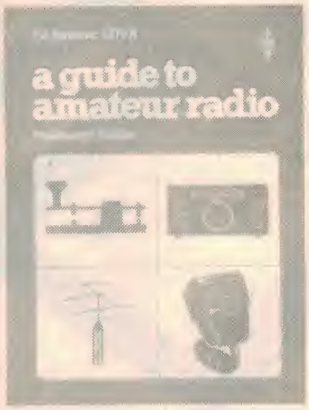
But what must be the prize howler is the statement, in the same section, that, "Telephone cables on poles have a characteristic impedance of 600 ohms."

Well, really!

But these criticisms aside – and they are, after all, only a very small part of the whole – the book must still be regarded as a serious and worthwhile contribution to the amateur study scene. It provides an excellent starting point for any prospective candidate, offering both the basic information and a sense of the examination standard involved. At the modest price quoted, no candidate should be without it.

Our review copy came direct from the publisher. (P.G.W.)

And from the RSGB



A GUIDE TO AMATEUR RADIO by Pat Hawker (G3VA). Published 1983 (19th edition) by the Radio Society of Great Britain. Soft covers, 156 pages, 183 x 245mm. Illustrated with circuit diagrams and photographs. ISBN 0 900612 62 2. Price in UK £2.75.

The stated aim of this book is to assist the newcomer to learn more about the hobby, and to help obtain a transmitting licence. To this extent, at least, its objectives run roughly parallel to those of the Australian "Novice Operators Theory Handbook" reviewed elsewhere in this issue.

Having said that, we would emphasise that we have no intention of comparing the two books, which have quite different approaches to the same subject. Suffice it to say that the two books would seem to complement each other very nicely and any prospective amateur with both volumes would be off to a good start, for a very modest outlay.

The RSGB is well known for its publications, including its "Handbook", and its monthly publication, "Radio Communication". All are very highly respected, world wide, including previous editions of this book, which was first published in 1933. Similarly, the name Pat Hawker has become almost as well known in association with RSGB publications.

This edition is well up to the standards of its predecessors, but has been updated considerably, particularly in regard to commercial equipment. Particularly useful is a list, covering some eight pages, of commercial amateur equipment carrying British, American, and Japanese brand names, with a brief resume of each type number. While not all may be available on the Australian market, a great many are and the list is still valuable.

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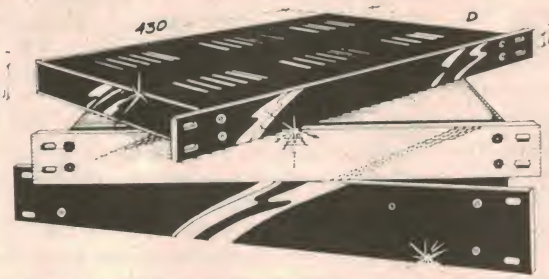

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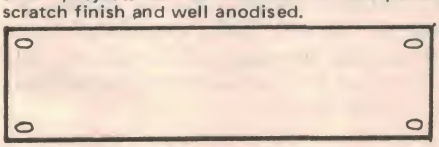

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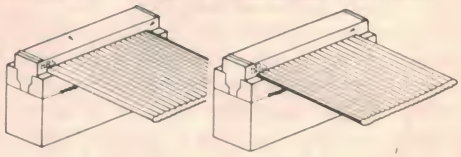

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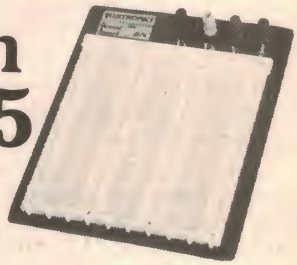

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review provides an excellent example of modern operatic production at its most highly professional.

The opera is full of delightful melodies, although none has yet reached the popularity of those from better known works. But played with refined enthusiasm by a deliciously sounding orchestra under Riccardo Chailly, it should relax you, whatever your mood.

I have one real objection, however – considering the period at which it was written: should the musical recitatives be accompanied on a harpsichord? Though it sounds charming, it still sounds anachronistic to me. For the rest, it is a set that every Rossini-lover should acquire. (J.R.)

MEET THE BUSKERS!

A LITTLE STREET MUSIC. – The Cambridge Buskers (Michael Copley and David Ingram) in a recital of popular short pieces of "classical" music on various instruments. DGG Stereo Analog Disc 2536 414.

This unusual production makes a delightful minor art out of busking, not only in its musical side but also by the elegant way it's presented.

Busking must have been started by beggars making some sort of noise to attract the attention of passers-by. Music was adopted to show they were prepared to work – an important factor in influencing some contributors to feel they were getting a return for their money. But never before have these street performers, however good, achieved the almost universal success of the two on this handsomely made disc.

They met at Cambridge, England, where Copley was studying advanced music and Ingram French and Russian. According to the sleeve notes, they were on a visit to London when they found themselves without the fare back to Cambridge. So they busked to get it. (The notes don't explain how they happened to have an assortment of musical instruments so conveniently with them!)

They were so encouraged by the "take" that they repeated the act in many cities in the UK and on the Continent. Then some enterprising producer at DGG thought it might be a good idea to record them. It was!

By the way don't forget that Copley was already an accomplished musician, while his partner, between his French and Russian studies, had achieved more than competence on the piano-accordion. Copley's major contribution to this recital is made on an astonishing variety of instruments – flute, sopranino recorder, piccolo, octave soprano recorder, descant recorder and tonette. He is expert on all of them.

Ingram contents himself with discreet accompaniments and encouragement on the squeeze box. They are personable young men (pictured above) both looking as guileless as lambs. They still busk but they also do the same act in filled concert halls in the UK and Europe, as well as sessions on TV.

Their programs, all arranged by Copley, consist of short pieces and little bits of symphonies and other classical forms. Throughout, they never fail to

STEREO VIDEO CASSETTE

Ivan Rebroff in concert

IVAN REBROFF IN CONCERT. Colour video cassette with mono compatible stereo sound. Recorded in the Melbourne Town Hall, October 1982. Running time 84 minutes. From South Pacific Video Pty Ltd, distributed through Star Video.

My first encounter with this (VHS) cassette really set me back. The picture came up on screen, bright and colourful enough to promise something rather special. But, alas; when Ivan Rebroff came on stage and opened his mouth to sing, no words issued forth – just a delayed echo from the depths of the Melbourne Town Hall.

I couldn't believe that the cassette was supposed to sound that way and only one explanation seemed possible: the stereo soundtracks had been recorded out of phase and, since I was playing it on a mono VCR, the centre image was cancelling instead of adding.

It transpired that I had received my review copy from a faulty batch and that it wasn't the first time such a thing had happened in the short history of stereo video cassettes. They will play on a stereo VCR – albiet with a rather vague centre sound-image – but they are not mono compatible.

The replacement cassette presented no problems, and the original went back to be re-recorded. So to the contents:

Ivan Rebroff here performs on stage in full Russian garb, beginning with fur headgear and a heavy, full-length fur coat, which looks weirdly out place under the blazing lights of the Melbourne Town Hall in October. He has an amazing vocal range from a deep basso to a powerful high pitched falsetto, with the ability to glide from one to the other. It is startling, if nothing else.

He is supported by a group of very talented musicians, also in ethnic costume, who feature separately during the concert, playing piano and grand organ, violin, guitars, and accordian.

The program which, on cassette, runs for 84 minutes, comprises a long opening bracket of Russian songs by Ivan Rebroff, followed by other brackets which embrace established favourites like "Volga Boatman", "Ol' Man River", "Nobody Knows The Trouble . . .", Handel's "Largo", selections from "Fiddler On The Roof", and "Lara's Theme".

The cassette notes describe the performance as "dramatic and flamboyant" and that is not an overstatement. The audience, which I would judge to have had a strong ethnic background, seems to have loved the occasion but, as viewed through the intimacy of a video close-up lens, the stage mannerisms of the group were a bit much for this matter-of-fact reviewer.

I felt more comfortable with that portion of the concert where they left the stage and did their thing – wandering minstrel style – in the aisles.

On the positive side, a lot of planning and skill has gone into the presentation of this cassette and the "spontaneous" segment from the body of the hall would have been a disaster if Ivan Rebroff in particular had not always been aware of exactly what was going on.

The picture quality is excellent and, played on a normal mono VCR, which most viewers will have, the sound quality is well up to normal video cassette standards. Not hifi, of course, but acceptable.

As to the concert overall, your enjoyment will depend largely on whether you can accept the sponsor's own description "flamboyant". If you can't, the stage mannerisms close-up will put you off. (W.N.W.)

show good taste and cheek. But don't let their success encourage all but the very best of our younger musicians. The two on this disc are highly skilled and make the whole experience great fun. (J.R.)

LOTUSLAVSKI: "picturesque"

LOTUSLAVSKI — Concerto for Orchestra. JANACEK — Sinfonietta. Chicago Symphony Orchestra conducted by Seiji Ozawa. World Record Club Stereo Analog Disc R 02181.

Although now in his early '70s, it is only during the last 10 years that Lotuslavski's music has received much attention outside his native Poland. He is a fiercely nationalistic composer, but because he is Polish, don't expect to hear anything in his music at all like the Chopin Mazurkas. Rather be prepared for something like Penderecki's, not in actual sound but in vocabulary.

I suppose an umbrella description would be avant garde though most of the real avant garde wouldn't agree with you. Orchestrally he is a picturesque technician. His material grows on one with repetition and his public is constantly expanding. It was not until the '50s that Lotuslavski's music became more contemporary than conventional.

It was the conductor Rowicki who commissioned him to write the concerto "to give the Warsaw Philharmonic something difficult to play". They got it! But, despite its many difficulties, it gets a fine understanding performance from Ozawa here.

The Concerto is unusual in form. Its first movement consists of two violently contrasted themes developed within seven distinct sections. This is followed by a nocturnal section of great beauty, whispered with the utmost sensitivity by the Chicago Symphony and all the more effective because it comes immediately after the violent dissensions of the first movement.

The whispering grows into an exhultant shout of a climax. Part of this movement, very fast but with no hint of scurrying, is contrasted this time with a run-of-the-mill Trio. The Finale is the longest movement, made up of such classical forms as Passacaglia, Toccato and Finale which, by this time, you are ready to greet as old friends — not a difficult feat in this score.

To those brought up on these forms, there might be a tendency to think they contain too many notes here. Still, remember that Rowicki wanted it to sound difficult.

I reviewed Janacek's Sinfonietta as recently as a couple of issues back — a performance by the Rotterdam under David Zinman. I feel I am not doing him an injustice when I write that I prefer Ozawa's performance on the reverse side of the Concerto as much sharper cut than Zinman's. And it also has the merit of underlining the marvels of Janacek's apparently ragged orchestration. Zinman is just a touch too smooth, too civilised. Ozawa makes Janacek's departure from the usual run of Western music more radical than Zinman. (J.R.)

DEVOTIONAL
. . . two generations

AGE TO AGE. Amy Grant with orchestra. Stereo, Myrrh MSB-6697. [From Word Records, Aust, 18-26 Canterbury Road, Heathmont, Vic 3135. Phone (03) 729 3777]

With management based in Nashville, Tennessee, USA, Amy Grant, I am told, just about heads the charts in terms of Australian Gospel record sales. That being the case, this latest release seems likely to strengthen her claim.

Without seeking to diminish Amy's own contribution, she certainly has a wealth of support, to judge by the jacket acknowledgments. Recorded in three different studios, mixed in a fourth venue and mastered at a fifth, there is abundant technical support.

Musically, she is backed by keyboards, bass, guitar, drums, percussion, saxophone, woodwinds, harp, strings, and a 10-strong vocal group on loan from Lamb and Lion Records. No wonder that they have been able to manage such variation in style from track to track.

Overall, the style would have to be described as soft rock, with a strong appeal to younger age groups. But, even if it isn't your favourite musical format, the merit of the arrangements and performance are undeniable. Indeed, I venture to suggest that some of the tracks will grab your attention, no matter how conservative your musical tastes.

Amy Grant's diction and the nature of the mix is such that you will need some help with the lyrics but, fortunately, these are set out in full on an inner sleeve. The Gospel themes are relevant to young Christians:

In A Little While — I Have Decided — I Love a Lonely Day — Don't Run Away — Fat Baby — Sing Your Praise To The Lord — El Shaddai — Raining On The Inside — Got To Let It Go — Arms Of Love.

Technically, the sound quality is first rate and, if you're partial to modern rock style Gospel, you'll thoroughly enjoy this one. (W.N.W.)

☆ ☆ ☆

THERE'S A SONG IN MY HEART. Tennessee Ernie Ford with orchestra and chorus. Stereo, Word WSB-8858. [From Word Australia, 18-26 Canterbury Rd, Heathmont, Vic 3135. Phone (03) 729 3777]

When I dropped this record into the studio, our staff photographer professed surprise: "Good heavens . . . is Tennessee Ernie still making records?"

The answer is obviously yes, even

though he is a contemporary of George Beverly Shea and already an established and mature Gospel soloist, when I first started these devotional review columns back in 1960.

Dressed and posed country style, he matches the setting with devotional songs sung in the C&W manner, featuring a bouncing instrumental and vocal accompaniment, and substituting rhythm for the powerful, sustained tones that were his forte in younger days. The titles:

I'll Fly Away — His Hands — I'll Be A Friend To Jesus — If I Could Hear My Mother Pray — Ol' Wooded Brook — Leavin' On My Mind — Operator — Jesus Paid It All — He Knows What I Need — Amazing Grace.

Backing is by strings, piano, synthesiser, guitars, bass and drums, with vocals by The Waters Blush. The diction is good, and arrangements and backing are excellent, as also is the technical quality. It makes for pleasant family Gospel listening and should appeal especially to those who, over the years, have enjoyed the many recordings made by the now veteran Tennessee Ernie. (W.N.W.)

BRAVISSIMO, DOMINGO, Volume Two. Stereo, 1982 from RCA ARL14414.

With the visit of Luciano Pavarotti fresh in mind, and the attention the visit focused on operatic singers, this album of arias by world renowned tenor Placido Domingo holds a special interest. Perhaps I should add that the interest need not be confined to lovers of opera. The sheer quality of Domingo's voice and of the orchestral support attracts and holds one's attention from beginning to end. This, despite the fact that the juxtaposition of one voice in so many roles tends to erode the dramatic context of the individual arias.

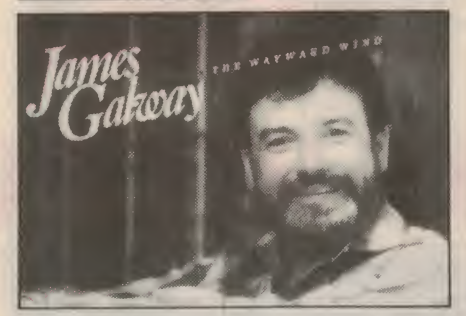
Without listing the titles of the actual arias, they come from: "Tosca" (Puccini); "Rigoletto" (Verdi); "Lohengrin" (Wagner); "La Juive" (Halevy); "Giordano" (Andrea Chenier); "Il Travatore" (Verdi); "Martha" (Flotow); "Xerxes" (Handel); "La Navarraise" (Massenet); "Eugene Onegin" (Tchaikovsky).

Orchestras include the New Philharmonia, the "Royal Philharmonic", the National Philharmonic, the London Symphony, and the Vienna Symphony.

The sound quality throughout is excellent and helpful notes by Richard Mohr round out what should prove, for most, a very enjoyable album. (W.N.W.)

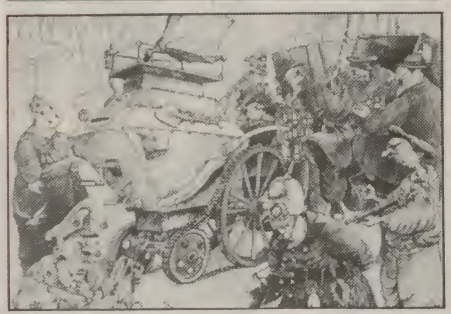
☆ ☆ ☆

THE WAYWARD WIND. James Galway. Flute with orchestral and vocal backing. Stereo, RCA APL14222.



When this album first made its debut on the airwaves, I faced one persistent question at home: "Are you going to get that one for review?" At the time I could only answer "maybe" but it did turn up and proved to be a happy addition to the family record library.

James Galway's versatility and skill as a flautist is legend but I doubt that you will hear it demonstrated in a more amusing and convincing way than on his rendition here of "Duelin' Banjos", where he takes over the role of one of the banjos.



Recorded at Music City Music Hall, Nashville, Tennessee, James Galway has a wealth of support from vocalists and a children's choir, the Shelly Kurland Strings (real and synthesised) plus piano, synthesiser, guitars, drums, bango and harmonica. They're not all used at once, of course, but they do add variety to a varied program:

The Homecoming – Don't It Make My Brown Eyes Blue – Duelin' Banjos – Shenandoah – Montana Skies – Piper, Piper – The Wayward Wind – Winter Sunset – Drifter – Smoky Pines – Shaman (Medicine Man) – Dreams.

Technically, the quality is excellent and the program should appeal strongly to those who enjoy James Galway in a relaxed and informal mood. (W.N.W.)

☆ ☆ ☆

GOON SHOW CLASSICS, Vol. 7. "The Man Who Never Was", "The Case Of The Missing CD Plates". Mono. BBC Records 2964 058. (From the World Record Club R-91422.)

If you're the slightest bit partial to a recording of the famous old BBC Radio Goon Show, you'll enjoy it.

Although the Goon Show had an enormous following in its day, its devotees were predominantly listeners who had got to identify with the characters, the voices, the situations, the running gags and everything about the show.

Those not in this select group commonly tried in vain to follow the patter and noise – and then gave up!

The two episodes here are still very much the Goons but they're a bit more verbally transparent than others I have heard.

More than that, while the original episodes were broadcast respectively in February '58 and October '55, the album itself is dated September '80 and dedicated to the memory of the late Peter Sellers. It features two pictures of the young – and good looking – Sellers, plus a Spike Milligan and a Harry Secombe of the same era.

More than that, the full-colour front cover cartoon is a beauty by GoonLand standards. It complements the episodes perfectly. (W.N.W.)

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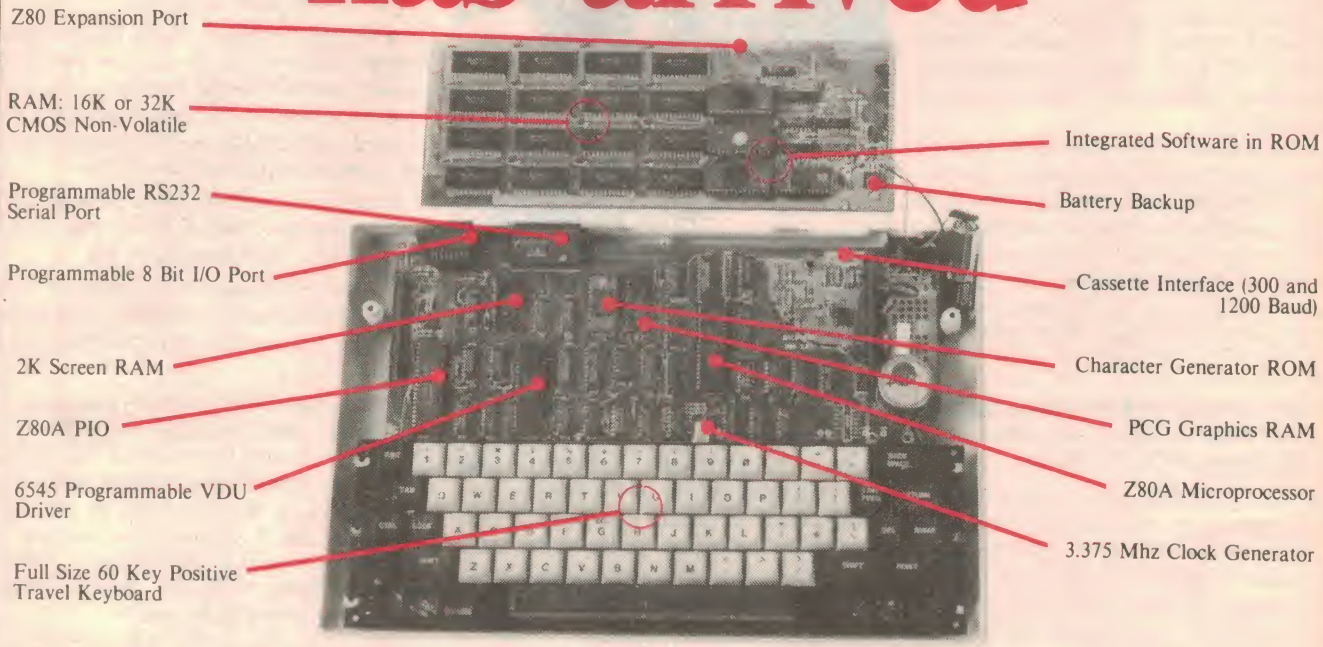

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National Panasonic's JB-3000 computer

The JB-3000 from National Panasonic is an elegantly styled state-of-the-art computer for the office or self-employed professional. Running MS-DOS, the JB-3000 is said to be compatible with the IBM Personal Computer, but includes features which may make it superior for some applications.

by PETER VERNON

Our review machine was initially supplied without any software apart from the MS-DOS system disk. Since this disk contains two versions of Microsoft Basic and various utilities it was quite enough to get started and to develop an appreciation of the qualities of the system.

Physically the JB-3000 is an attractive set-up. The low profile keyboard unit measures 430mm×220mm (W×D) and is not more than 38mm high, sloping to 10mm at the front. A wrist rest is included which is both comfortable and convenient during long typing sessions.

The keyboard is connected by a coiled cable to the "logic unit" which contains the main processor board and slots for expansion options. The system supplied for this review included 96K of RAM and a dual 13.5cm minifloppy disk controller board. Interfaces for a Centronics type printer and monochrome and colour video monitors are built in so these items do not take up expansion slots.

The logic unit itself is just 90mm high, 435mm wide and 333mm deep and a 30cm (diagonal) video display sits comfortably on top. The rear panel of the unit carries connections for RGB and monochrome video displays, a small reset button, volume control for the internal sound generating circuitry and the mains fuse and mains cord socket. A push button power switch is conveniently located on the front of the unit with a small illuminated panel above the switch to indicate "power on". Overall the impression is of careful engineering and attention to detail.

The minifloppy disk drives are in separate cabinets not built in to the logic unit. Apart from saving space in the logic unit, this approach means that 20cm disk drives can be added with a minimum of fuss when more storage is required. The drives use a locking lever rather than the conventional flip-up doors, and are almost silent in operation. Each 13.5cm disk provides 160K of storage when formatted.

Apparently Technics are responsible for the styling of the unit, and the result is pleasing. The disk drives and colour monitor are in cream with a charcoal-grey surround and front panel. The logic unit is also in cream enamel with a grey front panel decorated by an olive-green stripe.

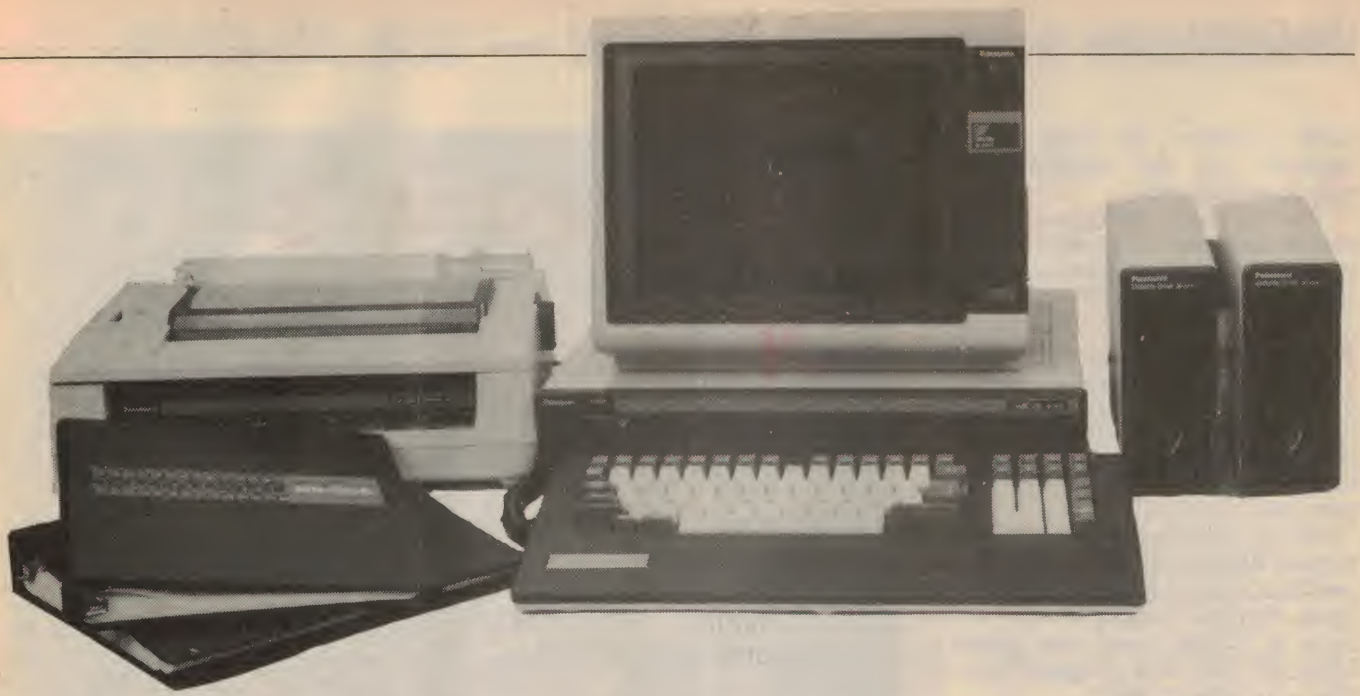
The keyboard has a non-glare top surface with the alphanumeric keys and separate numeric keypad in white. Control keys, special function keys and programmable keys are picked out in olive-green.

The eight programmable function keys (16 functions with Shift) can be assigned command strings of up to 15 characters each. When Basic is first loaded these keys are assigned various Basic commands, (their "default" values) such as LIST, LLIST, etc, allowing entry of the keyword with a single key press. The operating system also uses the keys to assist command line editing and to set display modes and colours.

Basic also includes statements which allow these keys to interrupt a program as it is running and invoke specified subroutines, so that programmers can write routines which use the programmable keys for special purposes.

MS-DOS has a rather unusual command line editing facility. As commands to the operating system are entered they are sent to a single line "template" buffer and the user can copy this buffer, delete selected characters or add new characters with the programmable function keys. The template always holds the last command line entered and all MS-DOS commands, such as DEBUG and FILCOM can make use of this buffer when input is required from the terminal. A command line can be repeated

The keyboard of the JB-3000 is well laid-out, with colour-coded function keys and separate numeric keypad and is a pleasure to use.



The system reviewed here includes dual 14cm disk drives and a dot matrix printer. Manuals for MS-DOS and Basic are at left.

with just two key-strokes, an incorrect command edited without re-typing the entire line, or minor variations of particular commands created with a minimum of typing.

Six other keys are included along the top of the keyboard, labelled "STOP", "COPY", "LABEL", "EC", "CLR" and "HOME". These keys are used in conjunction with the shift key. COPY in particular is notable. Whenever this key is pressed program execution will be suspended while the contents of the screen are copied to an attached dot matrix printer – excellent for producing hard copy of text and graphics. The JB-3021 dot matrix printer used for this review is covered in more detail later. Under MS-DOS these keys give the user the option of either copying a static CRT display to the printer or continuously outputting data to the screen and the printer at the same time.

A cluster of eight cursor control keys above the numeric keypad allows convenient cursor movement and insertion and deletion of characters. Two of the keys, labelled with small scroll arrows, are not used by the operating system, or Basic.

The video display is normally in "mode two", with text in an 80-column×25-line format. Graphics characters are available from the keyboard in this mode but colour cannot be used. Text is displayed in white characters on a black background on a colour monitor (a monochrome monitor can also be used).

We were supplied with an RGB colour monitor from Panasonic which provided an excellent display of both text and graphics. Text is displayed either in 25 lines of 40 double size characters or as 25×80 character lines. The 40×25 mode allows text display in any of eight colours on a background selected from the same eight-colour set. Some of these combinations such as green on green, are less than useful.

In the 80×25 line mode text is displayed as white on black. The display is stable, clearly readable and easy on the eyes thanks to the low-glare surface on the screen. Panasonic deserve full marks for this aspect of the system.

The inclusion of a 40×25 line display mode means that the JB-3000 could be used with a video monitor or converted television set which does not have the bandwidth to handle the 80-column format.

The operating system

Microsoft's MS-DOS provides a simple yet powerful series of commands and has a number of excellent features. First off, MS-DOS emulates calls to the 8-bit CP/M operating system so that most CP/M-80 assembly language programs can be made to work under MS-DOS with just minor modifications. The operating system itself is written in 8086

```
ABS, ASC, ATN, AUTO, CALL, CDBL, CHAIN, CHR$, CINT, CLEAR
CLOSE, COMMON, CONT, COS, CSNG, CSRLIN, CVI/CVS,CVD, DATA
DATE$,DEF FN, DEFINT/SNG/DBL/STR, DEF SEG,DEF USR, DELETE
DIM, EDIT, END, EOF, ERASE, ERR, ERL, ERROR, EXP, FIELD
FILES, FIX, FOR....NEXT, FRE, GET, GOSUB, GOTO, HEX$, INP
IF....THEN...ELSE, INPUT, INPUT$, INSTR, INT, KILL, LEFT$
LEN, LET, LINE INPUT, LINE INPUT#, LIST, LLIST, LOAD, LOC
LOF, LOG, LPOS, LPRINT, LPRINT USING, LSET, RSET, MERGE
MID$, MKI$/MKS$/MKD$, NAME, NEW,OCT$, ON..ERROR,ON..GOSUB
ON...GOTO, OPEN, OPTION BASE, OUT, PEEK, POKE, POS, PRINT
PRINT#,PRINT# USING,PUT, RANDOMIZE,READ, REM, RENUM,RESET
RESTORE, RESUME, RETURN, RIGHT$, RND, RUN, SAVE, SGN, SIN
SPACES, SPC, SQR, 'STOP, STR$, STRING$, SWAP, SYSTEM, TAB
TAN, TRON,TROFF, USR, VAL, VARPTR, WAIT,WHILE..WEND,WIDTH
WRITE, WRITE#
```

The statements and functions of Basic-86 are shown above. The table is reduced by 20% from the original print-out of the JB-3021 dot matrix printer.

```
BEEP,BLOAD, BSAVE, CLS, COLOR, COM, DRAW,GET, KEY, KEY(n)
LINE, LOCATE, ON COM, ON KEY, ON PEN, ON STRIG, OPEN COM
PAINT, PEN, PLAY, PSET, PRESET, PUT, SCREEN, SOUND, STICK
STRIG, TIME$
```

Statements added by BasicA provide for control of graphics, sound, joysticks, a lightpen and the optional serial interface of the JB-3000.

Business computer review — the JB-3000

code however, so users are not restricted by the inefficiencies of translated 8-bit code.

Other features of the operating system include the ability to re-direct input and output between the terminal console, a printer, and disk drives. There is no need to "log-in" disks, and the operating system will prompt the user to install the correct disk if a file is asked for which is not on the disk in current use. The built-in time and calendar functions also work with disk files, so that files include the time and date of the last modification in their directory data – a handy feature.

Software provided on the system disk includes Basic86, Microsoft's 16-bit Basic, and BasicA (for Advanced), which is the same Microsoft language with extensions to handle sound and graphics. Keywords for each language are as shown in Tables 1 and 2.

MS-DOS, one of the operating systems available for the JB-3000, is the generic version of PC-DOS supplied with the IBM Personal Computer. Internal commands (those which are loaded into memory when the computer is turned on) include commands to check the directory of a disk, to copy, delete and re-name disk files or display their contents, and the time and date functions.

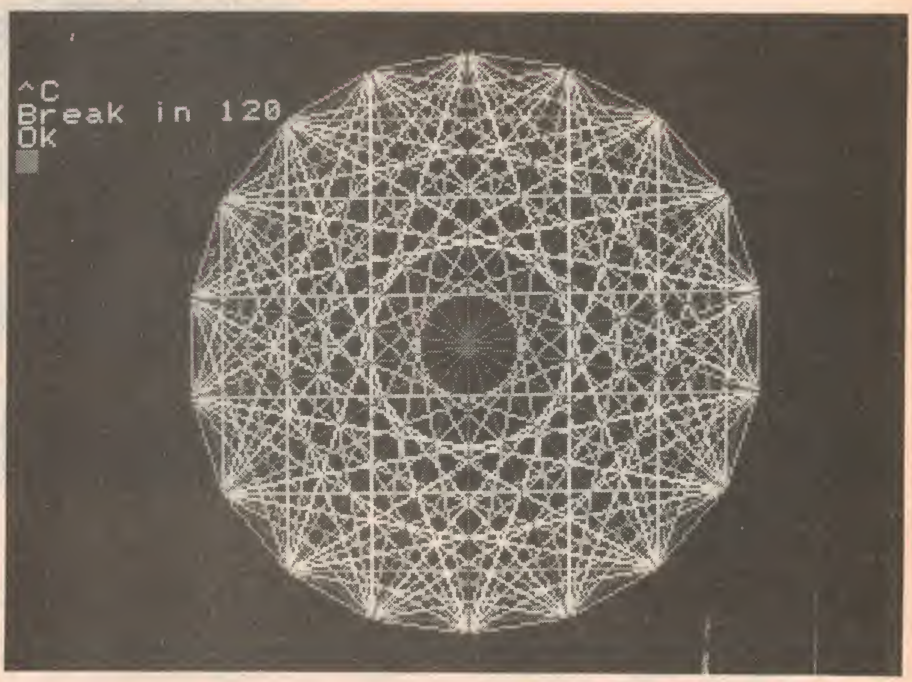
Other commands are held on disk until needed. These include the command interpreter itself, disk formatting, comparison and checking facilities, a line editor and DEBUG, a machine language monitor program. DEBUG, unlike the equivalent CP/M-86 utility program, does not include an assembler, making it of less use to the programmer.

The Format command allows formatting of disks and optional copying of all system files to a new disk, so back-up is easy. Edlin, the line editor, can be used for preparation of programs or other text and is a useful complement to more sophisticated word processing programs. DIR, used to check the contents of a disk directory, displays the file name and size of a file and the time and date of the last modification, a useful feature which is not provided by CP/M-86.

Two versions of Basic

Both Basic86 and BasicA are supplied with the JB-3000. Basic86 is a 16-bit version of Microsoft's version 5 interpreter while BasicA includes extensions for graphics and sound functions and incorporates an excellent screen editor which makes full use of the cursor control keys of the computer.

BasicA includes two "sub-languages", one for graphics and the other for sound and music generation. In addition it has extensions for handling a lightpen, joysticks, and the programmable function keys of the computer. A Basic compiler is also available.



Graphics resolution and text in the 40-column mode are shown in this photograph of the screen of the JB-3000. On the screen the graphics design is in eight colours.

A single manual is included covering both Basic interpreters and noting those statements and functions of BasicA which are not implemented in Basic86. In addition to sound and graphics functions these include BLOAD and BSAVE for loading and saving a binary image of memory on a specified device.

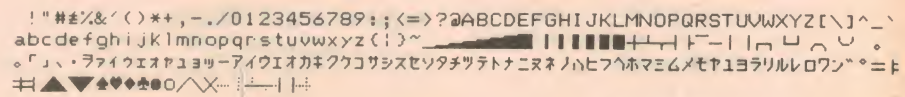
While most useful for machine language programs these statements are not restricted, and may, for example, be used to store a copy of a screen image on disk and restore it when required.

Also included in BasicA but not in Basic86 is the COM statement for control of optional communications ports, KEY, for defining and listing assignments of the programmable function keys, LOCATE, for control of cursor position on the screen and TIME$ for reading the value of the on-board timer. In short, Basic86 is a standard implementation of Basic for 16-bit machines while BasicA is adapted to the hardware features of the JB-3000.

The graphics functions are exceptional. What Panasonic calls "low resolution" mode provides a display of 320×200 pixels, in eight colours. Medium resolution is 640×200 while high resolution is 640×400 pixels. Both these last modes are available in monochrome only and display text and graphics characters in the 80 column × 25 line format. The highest resolution mode, 600×400 pixels, exhibits a disturbing flicker though, presumably because of the time taken to refresh the 32K bit-mapped display in this mode.

In low resolution the screen displays characters on a 40×25 format but allows the use of the full set of graphics statements of BasicA.

Anyone who has used the Tandy Color Computer will be familiar with Microsoft's graphics language. Statements are included to set or reset individual pixels, test the status of a pixel, draw lines between two specified end-points or lines relative to one specified point, draw circles and curves and PAINT areas of the screen until a specified border colour is encountered. These statements take parameters in the form of absolute or relative co-ordinates and a DRAW statement is also available which takes a string of motion com-



The character set of the JB-3021 dot matrix printer is shown above reduced by 20%. The graphics symbols and Japanese katakana character set can be redefined by the programmer and the printer is also capable of high resolution dot graphics.

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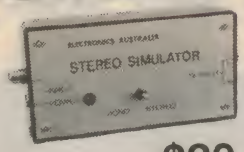

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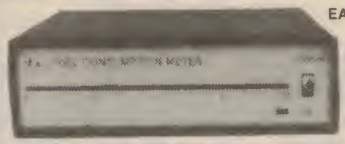

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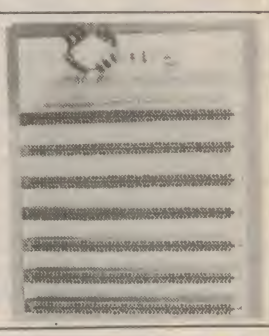

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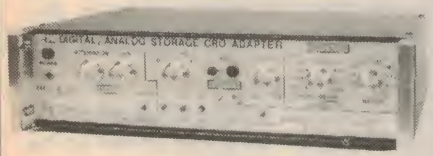

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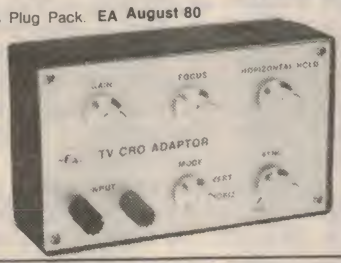

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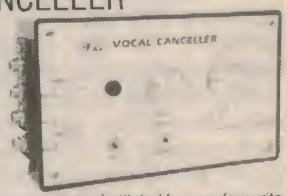

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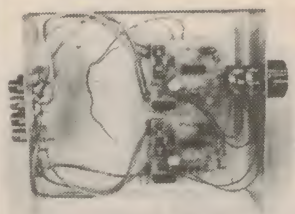

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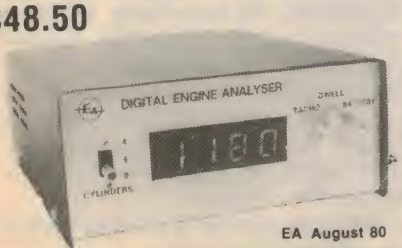

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APPLICATIONS SOFTWARE

The Computer Company, who distribute the JB-3000 in Australia, claim that the machine is compatible with software written for the IBM Personal Computer under MS-DOS. If this claim is interpreted to mean that standard disks can be taken from the PC and run without modification on the JB-3000 it is not quite correct. It is necessary to first re-format the disks using special "emulator" software available with the Panasonic computer.

A demonstration of the JB-3000 by the suppliers showed both WordStar and Dbase II software running on the system. The Multiplan electronic spread-sheet and other Microsoft packages are also available together with a variety of complete packages for retailers, the hotel trade and real estate applications. There is even a "Church Contributions Package".

Other "vertical market" applications packages will be available and a number of educational and entertainment packages are listed in The Computer Company's promotional material.

An independent company, Attache Software Pty Ltd is also producing software for the JB-3000. This series of programs is being specially written to take advantage of the high resolution colour graphics and large disk capacity of the Panasonic computer, and is being promoted as setting new standards for ease of use and documentation in the software market. The accent will be on business applications, with a general ledger and accounting programs the first releases.

WordStar

WordStar 3.0 is currently available for the JB-3000. This word processing program from MicroPro International is supplied on a 14cm diskette accompanied by a hefty manual in a ring binder and a spiral bound training guide. The manual is heavy going. As one author has put it "WordStar, like all of Micropro's software, is an impressive program but the manuals that explain it tend to be intimidating, repetitive and stuffy." (Arthur Naiman, **Introduction to WordStar,** Sybex, 1982.) The training guide is more useful. It contains a "short course" and an intermediate training course with practice exercises and examples to help the new user, and is conveniently organised for use as a desk-top reference.

WordStar in action. The photo shows the "no file" manual prior to beginning an editing session.

WordStar is known for its on-screen menus and use of Control keys to call up all functions. The main menu takes up the top half of the screen, although it can be suppressed if not desired. Supplementary menus cover the three levels of explanation of each command, block-move operations, printing options, commands for moving the cursor through large areas of text, and on-screen formatting. At help level 3 (the most extensive), explanatory menus can take up to half the screen space. Each menu is called up from disk when required by a Control-character key combination.

No attempt has been made to configure this version of the program to the JB-3000, so control keys must still be used. The cursor control keys and programmable function keys of the JB-3000 are inoperative — a pity, because these features would make WordStar considerably easier for the new user.

The problem is that with so many options and such flexibility, WordStar is correspondingly difficult to learn. There are literally hundreds of functions available to the user, many of them called into action by combinations of two or three control key codes. The on-screen menus are of little use, cluttering the screen while providing insufficient detail to be helpful, and the training manual can take the user only so far. Of course, not all features are required in any particular application and a subset of commands can be learned quickly. The problem with this approach however is the lingering feeling of overkill. Many of the options available will remain unused in typical applications, simply adding to the complexity of the program without benefiting the user. Anyone considering WordStar should expect to take several weeks of extensive use to learn to use the program effectively.

There are at least two approaches to WordStar on the JB-3000. Readers already familiar with WordStar will find the JB-3000 implementation to be absolutely standard while operation is enhanced by the quality of the system's keyboard and display.

Those considering the JB-3000 computer and looking for a word processor to run on it may prefer some other program which makes better use of the "added extras" such as function keys and colour capability. They may object to a program which takes no advantage of the sophisticated features of the computer they have paid for. Ultimately the decision must rest with the user, and made on the basis of previous experience, the type of work to which the program will be put and the proportion of time the computer will be used for word processing.

The choice of a word processing program is very much a matter of individual taste. There can be arguments on the merits of using special function keys as against Control-key combinations, whether menus should be constantly on view on the screen and whether the basic mode of operation inserts new characters into existing text or overwrites the old text.

Certainly control keys while harder

to remember are faster for a touch-typist who need not move fingers from the standard keys to invoke particular commands. Programmable and special function keys are conversely easier to learn but can slow down a touch-typist considerably.

On the other two points WordStar provides a choice. The menu display on the screen can be deleted, and the Insert function (normally on) can be altered to a "type over" function with the press of two keys (Control-V).

Multiplan

We were also supplied with Microsoft's Multiplan, a spreadsheet calculator. This program makes full use of the facilities of the computer, using the cursor control keys and special function keys to move around the spreadsheet and to call up various operations. Audible feedback is also provided to indicate that the computer has accepted the user's command and to indicate errors.

Multiplan is an impressive program, and the comprehensive instruction manual is clearly written, taking user step-by-step through the creation and editing of spreadsheets as well as providing a complete and detailed reference to all facilities available. As far as instruction manuals go this is one of the best we have seen.

In addition to the manual the program also includes an extensive series of on-screen explanations and descriptions of commands, which can be viewed at any time without interfering with work in progress.

Multiplan allows the user to set up an array of rows and columns, with each "cell" of the array containing either a name, a heading or a numeric value or a form the result of a calcu specified calculation. A single cell or a range of cells can be copied or repeated across the spreadsheet, edited, or referred to by name by other cells. Calculations based on the contents of any group of cells can be instantly updated when the contents of those cells are changed.

Multiplan shines as an aid in financial modelling and planning, business budgeting and decision making. Once the user has acquired some skill in using the program it can be turned to almost any application. Multiplan and the JB-3000 work together well, each bringing out the virtues of the other — power, flexibility, and ease of use.

mands and allows rotation and scaling of drawings.

Also available are the statements GET and PUT, which allow specified areas of the screen display to be stored as an array and then placed back on the screen, perhaps in a new position, or altered using one of the operators PSET, PRESET, AND, OR or XOR, which combine the contents of the array with the data already on the screen in a variety of ways.

All in all the graphics statements allow a great deal of flexibility in making use of the JB-3000's excellent video display.

The sound statements are easy to use. SOUND X,T will produce a tone of frequency XHz (between 37 and 32767Hz) with a duration of T "clock ticks". Clock ticks are produced by the internal timer at a rate of 18.2 a second and sound duration can be specified in the range 0 to 65536 "ticks". Minimum duration is therefore around 55ms and the maximum is just over an hour.

The PLAY statement takes a string expression indicating the note to be played, the length of the note, tempo, and a variety of other musical effects. Seven octaves are covered by the sound generator but only one voice is provided. The volume of the sound produced is controlled by the knob on the rear panel of the logic unit.

Basic86 is a full-featured interpreted version of the language containing 116 statements and functions, many of them with alternate forms and parameters. Hex and octal constants are supported and there is provision for calling in machine code sub-routines from within Basic. Both sequential and random access disk files are also available.

Integer and single and double precision arithmetic are provided and control structures include WHILE . . . WEND in addition to the familiar IF . . . THEN . . . ELSE. Programs can also be chained together, either sharing all variables or only those designated as COMMON.

A full complement of error handling functions and the TRON and TROFF functions are included for ease of program debugging.

Editing under Basic86 uses single letter keys combined with the control key to allow insertion and deletion within lines, cursor movement and addition of new statements. BasicA has a more convenient screen-based editor which uses the insert and delete keys. A feature of the BasicA editor is that program lines can be edited anywhere on the screen. A program can be listed on the screen, for example, and the cursor moved to the desired position. Once edited the new line can be entered into the program as listed. This facility is in addition to the editing functions invoked by the EDIT command.

Basic86 allowed the user to specify start-up parameters such as the number of disk files to be used, the maximum record size and the highest memory location to be used by Basic.

The DEF SEG statement will be new to users of 8-bit machines. This statement is used to define the current 64K segment of memory which will be referenced by following instructions such as USR. Together with an offset specified in the program the statement will result in a

JB-3000 SPECIFICATIONS

Processor: Intel 8088
RAM: 96K with 32K video memory, expandable to 256K
ROM: 16K
Interfaces: Monochrome and RGB video outputs, parallel printer port RS-232C interface available as an option
Keyboard: 93 keys with 16 programmable functions, 6 special functions, 8 cursor control and editing keys and numeric keypad.
Display: 80 x 25 or 40 x 25 double-size characters
Graphics: 320 x 200 resolution in 8 colours, 640 x 200 and 640 x 400 in monochrome. Text and graphics can be mixed in all modes
Sound: Single voice, 7 octave range
Disk drives: 14cm disks with 160K bytes storage per disk. Quad density 14cm disks available shortly providing 720K bytes per disk. 20cm disk drives are also available, providing 1.2MB per disk. A hard disk drive will also be available, providing 8.3MB storage
System software: MS-DOS, BasicA, Basic-86 and compiled Basic, Cobol and Fortran and Pascal.
CP/M86 and MP/M (multi-user) available shortly, with CIS-Cobol, Pascal/M, CBasic and assembler.
A CP/M 2.2 to MS-DOS or CP/M-86 conversion utility is also available.
Documentation: Generally good, although the quality of manuals for specific applications programs varies.

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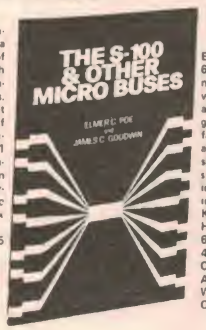

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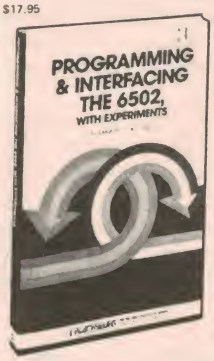

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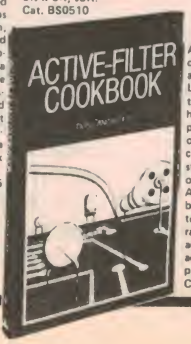

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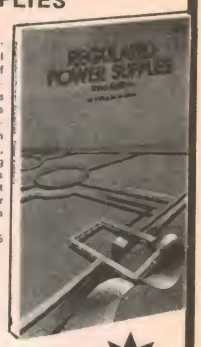

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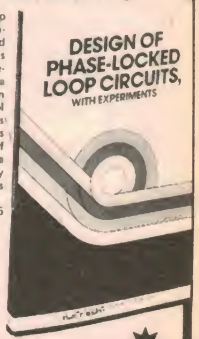

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The National Panasonic JB-3000

20-bit address, enabling up to one megabyte of RAM to be accessed from Basic!

Peripheral equipment

A complete Panasonic system includes a printer, and we were supplied with the JB-3021, a compact dot matrix printer using a Centronics-type interface. Characters are printed on a 7×9 matrix, with graphics on an 8×8 dot matrix. Print speed is up to 120 characters per second, bidirectionally, and up to 80 characters can be printed per line, at 10 characters per inch.

In addition to use for program listings and draft copies of text material the JB-3000 uses the printer to provide hard copy of screen displays. With two key presses the display on the CRT can be transferred to the printer. Colour is not supported however. A point on the screen will be printed as black with unlit points creating white space. As a result, text of one colour on a coloured background will not be reproduced on the printer – both colours will be printed as black.

When copying from the screen the printer uses a double-size character set formed on a 16×16 matrix with two passes of the print head for each line. The result faithfully reproduces the aspect ratio of the screen display, but of course takes twice as long as standard printing.

96 ASCII characters are provided by the printer character generator, and special graphics characters and dot graphics can be programmed.

Other peripheral controllers can be plugged in to a 3-slot "mini-motherboard" inside the logic unit. A hard disk drive and controller are on the way, and 20cm disk drives are available, each providing storage capacity of around 1.2 megabytes and also significantly increasing the speed of operation of the system.

A communications controller for local area networks will also be available for linking the JB-3000 with other computer systems.

A fully expanded JB-3000 can include 256K bytes of memory, two RS-232C serial ports and four disk drives. An expansion unit is also available providing additional slots for more peripherals.

The JB-3000 has a few peculiarities. In particular some aspects of BasicA are a little rough. Some mistakes in specifying graphics modes and operations for example, instead of producing an error message will re-boot Basic, wiping out the existing program. The printer, at least in the review system, was not fully integrated with the computer. Dollar signs were printed as what is apparently a Japanese Yen sign – although this problem is easy to rectify and may not show up in systems on the market.

The instruction manuals, while complete, are poorly organised. The use of separate schemes for pages and section numbering could cause confusion for example, when comparing the two Basics.

In conclusion

Considered without reference to IBM the JB-3000 is a powerful, easy-to-use machine, attractively packaged and available at an attractive price. Compatibility with the IBM Personal Computer must be considered an added extra because of the need for modification of disk formats before IBM programs can be used. The only way to get a guaranteed 100% IBM-compatible computer is to buy one from IBM.

The JB-3000 should not be considered as just another IBM clone, however. The superior graphics capabilities and larger disk capacity may make it a better machine in many applications. As long as sufficient software is made available the JB-3000 can more than hold its own, on its own merits.

Various JB-3000 configurations are available. A system with 128K of memory, monochrome video monitor, dot matrix printer, MS-DOS, Multiplan software and two disk drives is priced at around $5998. A 128K RAM expansion board is $533, and the RGB colour monitor would add about $600 to the price.

The price may also include training courses conducted by the Metropolitan Computer College. Maintenance contracts are also available, supported by STC Computer Service.

You can see and try out the JB-3000 at Angus and Robertson Business Centres, computer centres in some Grace Brothers stores and many other retailers. For further information contact The Computer Company Pty Ltd, 4 Cliff St, Milsons Point, NSW, 2061. Phone (02) 436 1733.

Microcomputer News

New products at Personal Computer Show

The First Australian Personal Computer Show was held at Sydney's Centrepoint from March 9th to March 11th this year, and from all accounts was an immensely successful event.

by PETER VERNON

Two of the new systems at the show were the Mitsui Sord M23P with microfloppy disks and LCD display and 64K CP/M disk versions of the Applied Technology Microbee.

There were 91 exhibitors, many of them displaying three or four different computer systems. IBM was out in force with a new computer, the IBM XT – an upgrade of their Personal Computer, announced just one month after the launch of the PC in Australia.

Apple's Lisa system attracted a lot of attention as one of the most innovative new systems on display. The price of the system at the moment puts it in a different market from that of the IBM and its look-alikes, but rumours abound of new, lower-cost implementations of the Lisa concept.

The Osborne portable seemed to appeal to many people looking for a low-cost business system – chiefly, one suspects, because of the software offered with the computer. Osborne have now gone into production with an 80-column card – designed in Australia – which overcomes the handicap of the 50-column screen.

Also announced by Osborne was a new networking system, O-Net, which allows four computers to share access to a hard disk drive – significantly increasing the storage capacity of the computers while also adding communications capabilities.

Japanese manufacturers were also well represented but many of their products showed a depressing sameness. Toshiba, Sharp and Okura presented Z80-based systems running CP/M and Microsoft Basic, which is nothing out of the ordinary. Seiko attracted more interest with an impressive 8088-based system.

The most attractive Japanese system would have to be the NEC Advanced Personal Computer. Using the 8086, the true 16-bit version of the 8088, the APC includes two 20cm disk drives and a high resolution colour monitor with the most impressive graphics capability of any machine at the show. Both MS-DOS and CP/M-86 operating systems are available, giving access to a wide range of software.

At the low end the most significant new releases were the colour and disk versions of Applied Technology's MicroBee computer. With 26 background and foreground colours, high resolution graphics and complete compatibility with earlier MicroBees the colour machine is certain to be a winner.

The disk-based MicroBee provides 64K of memory coupled with two "slim-line" 13cm minifloppy disk drives and CP/M 2.2. It may set a new low price for a CP/M based computer system.

Both Tandy and Commodore had displays of their low cost offerings, the Color Computer and the VIC-20, both eagerly surrounded by the school-children who were present en masse. Commodore also showed the VIC-64, although in a very low key way. It should be in the shops by the end of this month so readers can judge for themselves.

Again in the "low end" as far as pricing goes (but not in capabilities) was the BBC Microcomputer, a product which should give Tandy, Commodore and Atari a run for their money. With colour graphics, sound effects and an excellent version of Basic, the BBC Microcomputer will also have the marketing advantages provided by the Australian Broadcasting Commission's decision to screen the BBC's instructional series on microcomputers later this year.

An Australian Company, R.D.M. Computers Pty Ltd, were exhibiting a new single board computer, designed and manufactured in Australia specifically to run the newer, higher performance operating systems such as CP/M 3, MP/M II, CPNET 1.1 and Turbodos. On a single 420 × 297mm board are 256K bytes of RAM, four RS232C serial ports, a Z80A processor, two Winchester hard disk interfaces, a floppy disk controller capable of handling up to eight double sided, double density drives, video circuitry for 80 × 24 text and high resolution graphics and a keyboard port.

Called the "Aussie Byte", the board is offered fully assembled and tested with a 12 months warranty, for $950 plus tax.

Significantly, at least two exhibitors were displaying robots at the show. Jaycar Pty Ltd had the Genesis P-102 and the Micrograsp (which is available in kit form), while Mitsubishi showed their "Movemaster" robot arm. The Sorcerer Users Group of Sydney exhibited a more practical device, a computer-controlled engraving machine built by one of their members.

Perhaps the most notable aspect of the show was the relative absence of games. The emphasis was very much on the "serious" aspects of microcomputer use, with business applications occupying perhaps 85% of the show.

Also noticeable was the emphasis on "stand-alone" computers, perhaps linked into a network but each fully capable of all computer functions. With the decreasing cost of microcomputers the idea of multi-terminal systems with one central computer seems to be on the decline. The trend to built-in hard disk drives can only accelerate this movement.

Attendance figures indicate that over 23,000 people saw the three day show, well above the 15,000-20,000 initially expected. Many dealers reported a strong buying interest and many will gain quite a few customers from their participation.

DATA '83 exhibition for Sydney in May

DATA 83 will be held at Sydney's Centrepoint on the 17-19th of this month and from 8-10th November at the Victorian Expo Centre in Melbourne. Both exhibitions will provide an opportunity for visitors to view the latest in business computer technology in conjunction with a series of seminars on selection of computer systems, computers in manufacturing and office automation.

"Australia has emerged as one of the world's most dynamic computer markets. It is a market which is maturing rapidly with the highly competitive suppliers section now being matched by the emergence of a sophisticated business user market for their products", says Kevin Rebbechi, Managing Director of Graphics Directions Pty Ltd, promoters of the annual DATA exhibitions.

Companies such as IBM, AWA, Nashua, NEC, Adler, Tandy, Dick Smith, President Computers, Sharp and Sanyo will compete for the attention of visitors with over 270 stands displaying a wide range of equipment and software in what is Australia's largest annual computer exhibition.

Rent a computer from Grace Brothers

Grace Brothers has become the first major retailer in Sydney to offer a microcomputer rental service. Announcing the move, Grace Brothers' representative Carolyn Roberts stated "The obvious benefit is that microcomputers will now be available to a wide section of the community without incurring high capital outlay and expensive service agreements".

Grace Brothers will offer the Osborne 1 computer including software such as WordStar, SuperCalc and MBasic under the CP/M operating system.

The rental scheme includes replacement if the computer cannot be repaired on site and Grace Brothers will maintain their own service facilities with technicians trained by Osborne Computers.

Rental periods of 12, 24 or 36 months will be offered at rates of $158, $135, or $113 per month respectively. Customers may offer to purchase the computer at any time during the first two years of the rental period and 50% of the rental payments will be credited towards the purchase of the equipment.

For further information contact Grace Brothers Computer Rentals, 1 Waterloo Rd, North Ryde, NSW, 2113. Phone (02) 887 0133 or the Grace Brothers Computer Business Centre on the second floor of their Parramatta store. Computer rental outlets will also be established at other major Grace Brothers' stores in the near future.

GREAT NEW PRODU

You may have wondered why Jaycar did not (until now) sell home computers. We had many reasons but our main one was that we were not entirely "happy" with any of the units currently on the market. The closest we came to what we thought was a pretty good computer was the Apple. We thought that it was, quite frankly expensive. However it was sold and serviced throughout Australia by a reputable sales network – so there was no need for Jaycar!
That's why we got so excited when we saw the "Micro Professor MkII". It is the closest thing that we have seen to be software compatible with the Apple. Yes, we know what you're thinking. It's NOT one of those cheap Taiwanese "Apple" copies which infringe Apples' copyright. The Micro Professor MkII is a completely new and unique design in its own right. It just so happens that most of the widely distributed Apple software will run on this machine. O.K. But why so excited? LOOK AT THE PRICE! Check out the STANDARD FEATURES of this unit. Sit down. Think about it and COMPARE what you get with the Micro Professor MkII as STANDARD that are options on other machines!!

6 Colours

COMPUTER SENSATION!! Only $658

MICRO–PROFESSOR II OUTSTANDING!

Low cost colour computer with APPLE compatibility*

- 64K OF RAM SUPPLIED STANDARD all that you are ever likely to need.
- Text, Lo and Hi resolution graphics STANDARD
- Video AND TV (RF) output STANDARD
- Easy-to-use manual included in the price (over 248 pages)
- Power supply included as STANDARD
- Centronics printer interface STANDARD
- Multitech BASIC is compatible with APPLE II BASIC. Most APPLE software will run on the Micro Professor MkII

SPECIFICATIONS		
CPU		R6502
ROM		16K Bytes
RAM		64K Bytes
BASIC	Interpreter	More than 90 instructions stronger than those for Apple II
Video Display	Type	Memory mapped into system RAM
	Mode	Text, low resolution graphics, high resolution graphics (3 modes are mixed)
	Screen Format	960 characters (24 lines, 40 columns)
	Character Set	Upper case ASCII, 64 characters
	Character Type	5 x 7 dot matrix
	Graphics Capacity	1920 blocks (low resolution) in 40 x 48 array, 53760 dots (high resolution) in 280 x 192 array
	Number of Colors	6 colors
Keyboard		49 alphanumeric and function keys
Cassette	Interface	Use various cassette tapes and cartridges as data storage units
Software	Cartridge Interface	
Printer	Interface	Connects to printers with Centronics I/F
Display	Interface	Connects to color TV or video display
Remote	Control Paddle	Used for education & entertainment
Speaker		8 ohm, 55mm, 0.25W
Power		A switching power supply is provided to convert AC power to required power supply
Dimensions		241 x 175 x 30mm

*Most Apple Soft II BASIC programs will run on the MPF II.

PRO–GRADE SOLDER SUCKER

SEE REVIEW EA DECEMBER 1982
Our claim. The best solder sucker for its price in Australia!
– Unique double diaphragm design
– O-ring seal
– Spare O-rings supplied
– Teflon tip
– Self-cleaning plunger
– One hand operation
– Non slip body
– Pro-grade for heavy usage.
– 225(l) x 28(d)mm
– Spare Teflon tip $1.95

COOLING FANS 240VAC

Quality Ball Race construction now you pay no more for quieter, much longer lasting and more efficient ball bearing fans from Jaycar!

TWO POPULAR SIZES
12 WATTS 80x80x42(d)
$24.95 Cat. YX2510
13.5 WATTS 119x119x25(d)
$27.50 Cat. YX2514

MORE GREAT KITS

Cat. No.	DESCRIPTION OF KIT	Ref.	PRICE
KA1300	FUZZ BOX COMPLETE	EA 1/81	$ 19.50
KA1320	LE GONG	EA 3/81	$ 13.95
KA1346	PC BIRDIES SHORT FORM	EA 5/81	$ 14.95
KA1370	PHOTON TORPEDO	EA 9/81	$ 29.50
KA1400	METRONOME	EA 1/82	$ 16.95
KA1402	EPROM PROGRAMMER	EA 1/82	$ 59.00
KA1406	CUDLIPP CRICKET SHORT FORM	EA 2/82	$ 12.50
KA1408	DIGITAL STORAGE CRO ADAPTOR	EA 2/82	$110.00
KA1430	VOCAL CANCELLER	EA 4/82	$ 19.50
KA1432	VOX RELAY SHORT FORM	EA 4/82	$ 14.50
KA1450	GUITAR BOOSTER	EA 6/82	$ 14.50
KA1452	SUBWOOFER MOSFET AMP	EA 7/82	$ 79.00
KA1454	SUBWOOFER ENCLOSURE	EA 8/82	$ 79.00
KA1476	STEREO SYNTHESISER SHORT FORM	EA 9/82	$ 39.50
KA1478	STEREO SYNTHESISER COMPLETE	EA 9/82	$ 49.50
KA1482	POWER UP KIT COMPLETE	EA 11/82	$ 39.50
KA1484	SUPER SIREN SHORT FORM	EA 11/82	$ 5.00
KA1490	BOGGLE GOGGLES	EA 12/82	$ 9.50
KA1492	PH METER LCD	EA 12/82	$ 69.00
KA1494	PROBE FOR PH METER WITH BUFFER		$ 69.00
KA1498	AM WIDEBAND TUNER	EA 12/82	$249.00
KA1500	LED HEAD SHORT FORM	EA 1/83	$ 9.95
KA1510	STEREO SYNTHESISER SHORT FORM	EA 4/83	$ 11.95
KA1515	ALIGNMENT KIT AM TUNER	EA 3/83	$ 7.95
KE4050	50 WATT AMP MODULE	ETI 480	$ 23.00
KE4052	100 WATT AMP MODULE	ETI 480	$ 27.00
KE4064	PREAMPLIFIER MODULE	ETI 480	$ 30.00
KE4090	GENERAL PURPOSE PREAMPLIFIER	ETI 445	$ 7.99
KE4092	AUDIO LIMITER	ETI 446	$ 12.00
KE4094	BALANCED MICROPHONE PREAMPLIFIER	ETI 449	$ 5.50
KE4105	CAR ALARM	ETI 330	$ 29.50
KE4205	LED LEVEL METER	ETI 458	$ 59.00
KE4206	MC MOVING COIL PREAMPLIFIER	ETI 478	$ 26.50
KE4207	MM MOVING MAGNET PREAMPLIFIER	ETI 478	$ 19.50
KE4210	MOSFET AMPLIFIER	ETI 477	$ 59.00
KE4220	150 WATT MOSFET AMPLIFIER	ETI 499	$ 79.50
KE4222	150 WATT MOSFET PREAMPLIFIER	ETI 498	$ 39.50
KE4225	BRIDGING ADAPTOR	ETI 479	$ 9.95
KE4405	+/– 15 VOLT POWER SUPPLY	ETI 581	$ 17.50
KE4410	POWER SUPPLY 13.8 VOLT/10 AMP	ETI 160	$ 79.50
KE4505	SOUNDBENDER SHORT FORM	ETI 492	$ 24.50
KE4552	UHF CONVERTOR	ETI 735	$ 32.50
KE4554	VIDEO MODULATOR	ETI 760	$ 12.99
KE4560	LOW OHMS METER	ETI 158	$ 29.50
KE4570	POWER SUPPLY 0–30 VOLTS 1 AMP	ETI 162	$ 49.50
KE4600	MODEM SHORT FORM	ETI 644	$169.00
KE4602	MODEM COMPLETE	ETI 644	$189.00
KJ6502	SYNTOM DRUM SYNTHESISER KIT		$ 36.50
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NEW!

MICRO CHARTS

Instant Data on the Most Popular Computer and Microprocessor Parts

- Fully decoded data – no need to uncrumble numbers
- Instant Access
- Compact 8½" x 11" size
- Durable rigid card plastic – lasts a lifetime
- Perfect for programmers and engineers – two sided and totally comprehensive
- Clear and concise tables for full instruction set (ex assembly ASCII base conversion effect flags (op-pair vs jump interrupt structure pinout cycle times diagrams bug notes and much more

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Keep your precious (and expensive) magazines in order for easy reference. Smart blue colour with gold lettering. Heavy gauge and richly chromed metal fittings.
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Our wirestripper, nicknamed 'Tyranosaurus–Rex' is far from extinct! It's a great way to strip all sorts of cable without damaging the conductors. It's also a price breakthrough!!
– Automatically adjusts to insulation diameter.
– One hand operation.
– New low price for an automatic wirestripper

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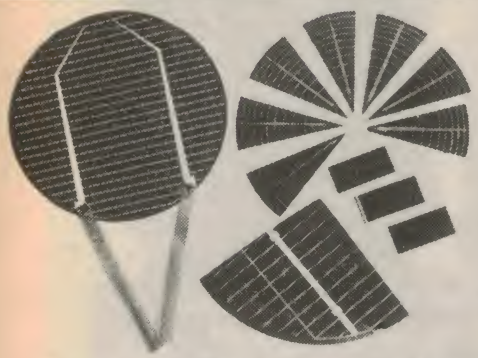

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We now stock a COMPLETE range of high efficiency Silicon Solar Cells All cells will give 0.45V under rated load and they can be stacked in series or in parallel for higher current.

Cat. No	Description	Price 1-9	Price 10+
ZM9002	Rect. 10x20mm 45mA	$2.95	$2.45
ZM9003	3" diameter 1 amp	$29.50	$26.50
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8 CHANNEL MIXER KIT

- Balanced (600 Ohm) Mic. Inputs/Line Inputs.
- Cannon Connectors included in the price.
- Bass, Mid & Treble Equalization on each Input.
- "Effects" (i.e. Echo etc.) capability.
- Foldback and Stereo Pan on ALL 8 Inputs.
- 60mm Slide Faders used throughout.
- 19" Rack Mount capability (or Console Mount).
- Professional Black Front Panel with Format borders & multi-coloured knobs to assist function identification.
- VU Metering.

FEATURE PROJECT IN APRIL EA

THE BEST

We are proud to announce a great new range of DIRECT IMPORT all – ABS plastic cases for the discerning electronics enthusiast. Quite frankly we are sick and tired of those black flimsy styrene boxes with their Aluminium lids. They split, they shatter and they look plain ORDINARY.
Shown below is a range of boxes that is going to revolutionise your small projects. Each box has a precision fitting MOULDED lid (in the same colour as the box) with moulded-in brushes to take metal thread countersunk screws. True quality. Naturally each box has slots formed in the sides to take PCB's etc. Most are available in 4 Beautiful colours – Black is one of them!!
Shown also are 2 new sizes of die cast box. Note the sizes.

CONSOLE BOXES

EACH UNIT HAS AN ALUMINIUM FRONT PANEL

SIZE –161(W) x 96(D) x 39(HF) x 57(HR)mm
Cat. HB6200 – ORANGE Cat. HB6201 – GREY Cat. HB6202 – BLUE Cat. HB6203 – BLACK
PRICE 1 – 9 UNITS ONLY $6.95 EACH: 10 OR MORE $6.45 EACH

SIZE – 215(W) x 130(D) x 47(HF) x 73(HR)mm
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SIZE – 105(W) x 143(D) x 32(HF) x 56(HR)mm
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SIZE – 170(W) x 143(D) x 32(HF) x 56(HR)mm
Cat. HB6230 – GREY Cat. HB6231 – BLUE Cat. HB6232 – BLACK
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SIZE – 170(W) x 214(D) x 32(HF) x 82(HR)mm
Cat. HB6240 – GREY Cat. HB6241 – BLUE Cat. HB6242 – BLACK
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SIZE – 100(L) x 50(W) x 25(D)mm
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SIZE – 112(L) x 62(W) x 31(D)mm
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SIZE – 120(L) x 65(W) x 40(D)mm
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SIZE – 190(L) x 110(W) x 60(D)mm
Cat. HB6160 – ORANGE Cat. HB6161 – GREY Cat. HB6162 – BLUE Cat. HB6163 – BLACK
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SIZE: 50 x 50 x 31mm Cat. HB5010 1–9 $3.95 each; 10 or more $3.45 each
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Video Enhancer

NOT A KIT BUILT AND TESTED...

Cat. AV6500

$89

Unbelievable but true. This unit enables you to actually IMPROVE a copy of a recorded video tape. How? By amplifying the top end of the video signal by a small amount. This sharpens up the detail of the picture. Dubs can actually look better than the original. Works as a video distribution amplifier as well. Will drive up to 4 VCR's from one VCR ipput.

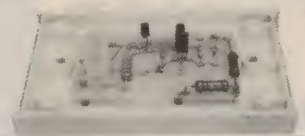
VIDEO STABILISER Cat. AV6502

As many of you know, many video tapes, – especially from the USA have the sync pulses suppressed to prevent unauthorised copying of the original dub. This process is fine because it hinders unauthorised re-recording (dubbing) of material. It is annoying though when you hire the original and find that the "Copyguard" is causing problems with your TV. The AV6502 re-inserts the sync pulses automatically and restores stability.
WARNING! The AV6502 is intended solely for the use above. Whilst the AV6502 will virtually remove copyguard on a tape copy (and hence restore the picture) it is against the law to unlawfully copy copyright material.
The AV6502 looks almost identical to the AV6500 **ONLY $79.95**

NEW *Touch Sensitive Light Dimmer*

Ref: EA April 1983
Complete kit including quality HPM wall plate with attractive brushed metal insert.
The Jaycar kit is absolutely complete including a small dial spring which can be used to connect the PCB to the wall plate. (Beware of other kits that do not include this)
In addition to the above, we supply the High Voltage Resistors ALREADY SOLDERED in as a foolproof safety feature!
Buy the complete kit for this exciting project for only
Cat. KA-1508

***only* $19.95**

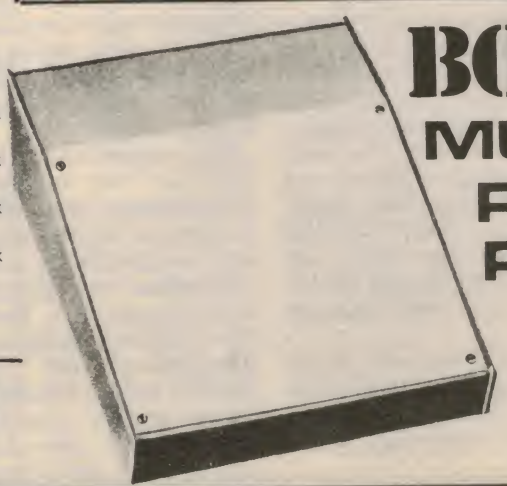


NEW! 3–50V @ 5A SWITCHMODE POWER SUPPLY!

Spectacular new design by EA features extremely simple construction with enormous power capability.
Get the COMPLETE KIT (with special meter scales included) from JAYCAR for only:

$149 – STAGGERING VALUE

Cat. KE1520 SEE EA MAY 1983



BOXES MULTI PUR-POSE

JAYCAR

SEE THE OTHER JAYCAR ADS IN THIS MAGAZINE FOR OUR STORE ADDRESSES AND PHONE NUMBERS....

Microcomputer News

IBM cuts price of Personal Computer

Devaluation of the Australian dollar may well be expected to increase the price of imported computer equipment, but IBM for one moved against this trend with cuts in the price of its recently released Personal Computer.

The price of the basic system has been reduced by 5%, from $3,224 to $3,066 while prices of add-on disk drives have been cut by 38%. An IBM communications adapter board to allow the use of a modem now costs $188 – down 12%.

According to IBM the new prices are the result of "normal business reviews" which took into account the impact of inflation and currency fluctuations as well as the costs of doing business.

The price changes in Australia have followed the same pattern as those in the United States, where IBM claims to have sold more than 200,000 units since the Personal Computer was released in August 1981.

The price of the IBM XT, an enhanced version of the Personal Computer released in Australia in March, has not been affected. The XT includes as standard a PAL colour video board and the communications adapter and comes with a built-in 5MB hard disk drive. Prices start at around $7000.

Two new printers from Epson

Following the success of the Epson MX-80 and MX-100 printers Warburton Franki has announced the release of two new Epson models, the RX-80 and FX-80, said to provide significantly expanded facilities while retaining the basic features of the MX-80.

The Epson RX-80 will sell for $765 and offers printing speeds of up to 100 characters per second, parallel and serial interfaces, in-built italics and Elite type fonts and graphics modes while supporting all MX-80 control codes. The FX-80 in addition offers standard friction and sprocket paper feed, single sheet paper feed, the ability to down-load a type font or vertical formatting instructions, five new graphic modes and printing speeds of up to 160cps, at a retail price of $1155.

For further details of the new Epson printers contact your local Warburton Franki office or the head office at 372 Eastern Valley Way, Chatswood, NSW, 2067.

Toshiba T-100: portable or desktop use

A new computer was launched recently by Toshiba (Australia) Pty Ltd. Speaking at the launch, Mr Trevor Thacker, managing director of Toshiba Australia noted that Toshiba is Japan's third largest semiconductor manufacturer, with activities in consumer products, industrial electronics and heavy equipment. Last year the company spent $A200 million on research and development in the office automation area.

At first sight Toshiba's offering seems very much a "me too" product. A Z80A processor, 64K of RAM and CP/M80 usually only provokes a yawn these days.

Looking more closely though, Toshiba's new T-100 does have some unique aspects. It will be available in three versions – a portable, with cassette recorder and 80 character × four line liquid crystal display, or with a monochrome or high resolution eight colour video monitor. The portable version can, and does, fit into an attache case (admittedly without much room to spare).

Software will be available in plug-in ROM packs, although with the addition of dual double-density disk drives the system will run CP/M-80. Battery-powered RAM packs will also be available, capable of storing programs and data for up to a year while not installed in the machine, but appearing as ordinary read-write memory to the processor.

The pricing is competitive. The portable configuration will cost $1473, with a business system with dual disks, green phosphor monitor and dot matrix printer for $4327. A T-100 with colour monitor and printer will be $5158.

To accompany the T-100 Toshiba also announced a new printer, the P1350, a dot matrix printer which uses a 24-wire print head to produce "correspondence quality" printing at 100 characters per second. Without a magnifying glass, print samples are said to be indistinguishable from that of a daisywheel printer. When combined with draft printing speeds of up to 192cps, software controlled type fonts and high resolution dot graphics, the P1350 should arouse a lot of interest. It is not the printer offered in the T-100 package deal, however. The P1350 is priced at around $3300.

Further information on the T-100 and the P1350 printer can be obtained from Toshiba (Australia) Pty Ltd, 82-94 Talavera Rd, North Ryde, NSW, 2113. Phone (02) 887 3322.

The Atac group (Australian Technology and Computers) will also distribute the P1350 printer for use with other computer systems.

Boom in modems and communications

Modems and communication software now form the fastest growing segment of the personal computer market in the United States according to a new report from International Resource Development Inc. Sales are predicted to increase at a rate of 60% a year.

Many present owners of personal computers are now installing modems to take advantage of a wide range of information and remote processing services such as Compuserve and "The Source" while others are turning their computers into electronic mail terminals. Installation of separate modems and increased purchases of new computers with modems already installed will boost the modem market to $US385 million by 1985 says IRD, while data communications software and network services will account for around $US415 million.

According to the IRD report several software companies and manufacturers of electronic games are exploring the possibilities of "teledelivery" of games, music, video and computer programs. Under this scheme the user would order the desired product by telephone or an interactive teletex system and have it transmitted to his own computer immediately. Billing, presumably will also be taken care of by remote control.

"The computer retail stores are just catching on to the dangers of teledelivery, in which retailers are bypassed by publishers transmitting material directly to the purchaser," says one IRD researcher. Arcade games could also suffer from direct delivery of video games direct to home computers and terminals.

SAVE $250

ON DICK SMITH BLUE LABEL SYSTEM 80 COMPUTER NOW ONLY $499.00

Cat. X-4005

Take advantage of this once-in-a-lifetime special offer . . . Bulk purchase has allowed us to slash the price of this popular computer!

WAS ~~$750~~

NEW MODEL EXTRA FEATURES!

The System 80 hasn't become Australia's fastest selling home computer by accident! It was designed to exacting quality control standards to include features of the world's most popular home computers and to be software compatible with Tandy computers so there would always be plenty of programs available to make your computer useful, educational, entertaining and worthwhile.

It's a complete, ready-to-go computer, you don't have to buy any add-ons to make it work. It simply plugs into the aerial socket of your TV and has an inbuilt cassette deck to run your programs.

Compare the Dick Smith Blue Label System 80 Computer with Apple II and/or Tandy Model 3 Computers. and you will know why we have sold over 13,000 in Australia and many thousands world-wide. It's simply more powerful and we believe 10 times better value for money in comparison.

The Blue Label System 80 is not just affordable – it's usable as well!

- Flashing cursor.
- Built in speaker and amplifier for programs with sound effects.
- Full upper and lower case video display capability.
- Monitor program (suitable for the hobbyist to program in machine language.)
- Three month guarantee from date of purchase.
- Screen print facility (obtain a printout of any 'page' appearing on screen.)
- Great expansion capability and flexibility.
- No separate tape recorders to buy as one is inbuilt.
- Cassette level meter and provision for a second cassette recorder.

HOW CAN WE DO IT?

Simple! The new SYSTEM 80 is cheaper than the original model for two reasons: The massive costs of initally developing this computer have been fully absorbed, and . . . New technology produces better quality components at a much cheaper price! Look at the extra features! Look at the compatible software! LOOK AT THE PRICE!

HFC FINANCE ARRANGED FROM **$11.44** per wk FOR 12 MONTHS. DON'T MISS THIS OPPORTUNITY!

DICK SMITH ELECTRONICS

See Page 98 for address details

HFC

YOU REAP THE BENEFIT!

DSE/A467/PAI

Microcomputer News

Programmable characters for the Super-80

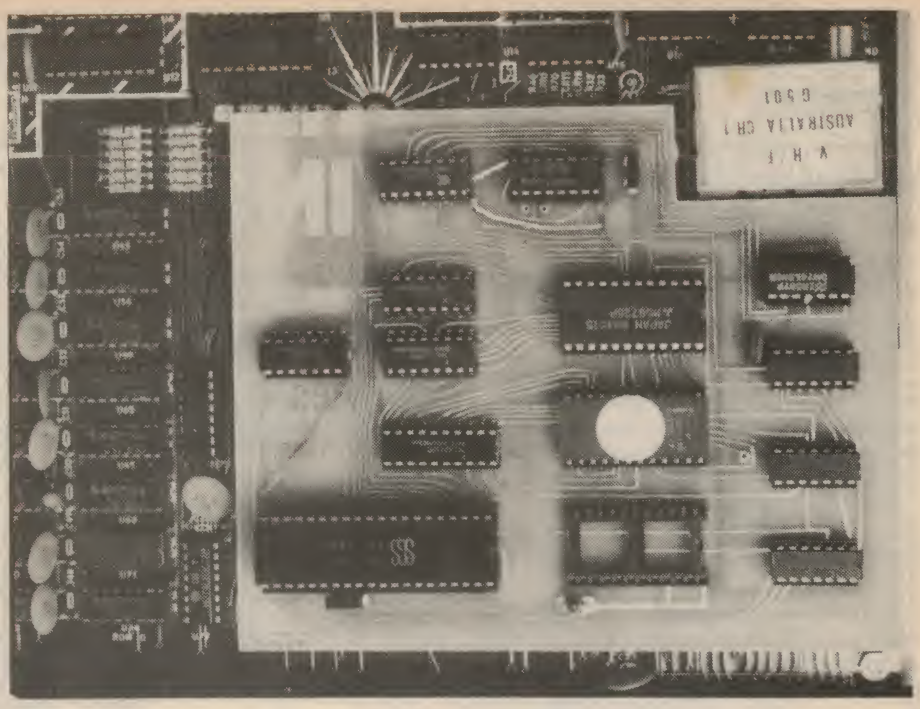
A Queensland firm, the Computer Clinic, now has available a programmable character generator for the Super-80 computer.

The character generator adds an additional 4K of memory to the Super-80 in locations F000 to FFFF and provides standard upper and lower case characters and games graphics in EPROM and sufficient RAM to contain the definitions of an additional 128 characters formed on the standard 8 × 10 grid used by Super-80 characters.

The kit arrives packed in a plastic bag with the PCB itself measuring 121mm × 145mm (less a small rectangular cut-out to clear the Super-80's RF modulator). The add-on board is well made and is double-sided with plated-through holes. All required parts are provided, including sockets for all ICs (a total of 13), a small length of solder and hook-up wire and comprehensive instructions.

The board is connected to the Super-80 by means of three wire-wrap sockets which protrude below the PCB. The pins of these sockets plug into the original socket of the Z80, video shift register and one IC in the timing chain while the chips originally on the Super-80 board are plugged into the new PCB.

The 2513 character generator provided with the Super-80 is also removed and is not used by the programmable character add-on. One wire link is required on the Super-80 board itself.



The 6116 2K × 8 RAM is provided to store programmed character definitions while standard characters are stored in a 2516 EPROM. A socket is provided for a second, optional EPROM which can be installed by the user and used to store pre-programmed character definitions which can be transferred to the RAM character generator as required.

This facility allows the user to create customised character sets and store them permanently with the use of an EPROM programmer. Needless to say, the contents of the additional RAM can also be stored on tape and reloaded for later use with the Super-80 Monitor tape routines.

A 12-page instruction sheet is included with a kit containing assembly instructions for beginners and experienced hobbyists, circuit diagram and component layout and a description of the principles of operation, with sample programs.

Assembly of the kit is straightforward although installation requires some care in ensuring that the pins of the three wire-wrap sockets are aligned and correctly inserted in the vacated sockets of the Super-80 board. This is the only tricky part of the entire operation. The kit fits without difficulty in the standard Super-80 case.

In short, an accessory which should be of interest to all users of the Super-80 computer.

Cost of a complete kit for the programmable character generator is $89.95, while the character set EPROM, PCB and instruction manual are available for $47.50. For further information contact the Computer Clinic, PO Box 68, Aspley, Qld 4034. Phone (07) 269 8573.

Microcomputer News

Hard disks for Apple and IBM computers

Sydney company Imagineering is now distributing Davong hard disk drives for the IBM Personal Computer and the Apple II.

Five, ten and 15 megabyte versions are available and the five megabyte drive is available in an internally mounted version for the IBM PC (in place of one of the 13cm minifloppy disk drives).

Davong Systems supply software to use a hard disk with the IBM disk operating system, and also plans to support CP/M-86 and UCSD Pascal when they become available through IBM. The software modifies the IBM DOS to refer to the hard disk as one to five volumes (selected by the user). For a large data base for example, a single five megabyte volume would be used, while a large number of small text files could be more appropriately stored as five one megabyte volumes.

A system diskette provides programs for making the required changes to IBM DOS, backing up files from the hard disk to floppy disks, a disk text and copy programs and a formatting utility.

The Apple II versions of the Davong drives can be used with Apple DOS 3.3, Apple Pascal, and CP/M on the Microsoft "Softcard". Features of the supporting software include mixed DOS, Pascal and CP/M volumes on the hard disk, a volume manager to list, create, delete and initialise volumes, and back up utilities.

For more information contact Imagineering, 3/579 Harris St, Ultimo, NSW, 2007. Phone (02) 212 1411.

TCG pressure sensitive graphics digitiser

A graphics pen which adds pressure sensing to "bit pad" type digitisers is now available from the TCG Group.

The pressure pen allows greater versatility in drawing and painting with a digitiser as it is capable of differentiating up to 32 levels of pressure and providing information to control line width, line texture, grey scale, or colour in a computer generated image.

Controls for zero and maximum pressure adjustment are included to enable the user to adjust the pen to suit his own style of working and LEDs are used to indicate the status of the system.

For further information contact Jim Kennett, The TCG Group, 30 Balfour St, Chippendale, NSW, 2008. Phone (02) 699 8300.

AED to support systems from Applied Technology

AED Microcomputer Products and Applied Technology have announced that AED will provide on-going support for Applied Technology S100 boards and systems. Applied Technology is endorsing AED as the approved source for additional S100 boards and disk systems for the DG 680 microcomputer, and the company can also offer consultancy services and a wide range of CP/M software for the system. Microcomputer repairs and service contracts are also available.

A 20cm IBM standard disk system is now available from AED for the DGOS system. Single and double density and single and double-sided disk systems are available with either one or two drives. Storage capacity of a single-sided, single density 20cm disk is 600K bytes, increasing to 1.2 megabytes for double density operation. Both CP/M 2.2 and Microsoft Basic-80 are included in the price of the disk system and AED will also install and configure the disks for an additional fee.

For further information contact AED Microcomputer Products, 130 Military Rd, Guildford, NSW, 2161. Phone (02) 681 4966.

Illawarra group Super-80 open day

The Illawarra Super-80 Users Group will hold an open day on Sunday, May 29 at the Senior Citizens Hall, corner of Princes Highway and Collaery Roads, Fairymeadow (near Wollongong).

Displays and demonstrations will be held throughout the day from 10am to 4pm and anyone with a Super-80 with special modifications is encouraged to bring their machine along. Super-80s fitted with a variety of character generators and graphics modifications will be on display and some kits will be available from the users group on the day. Now's your chance to meet other users of the Super-80, to talk over problems and discoveries and see the latest in Super-80 add-ons and peripherals.

There is a $1.00 entry fee to cover the cost of hiring the hall and providing tea and coffee to visitors. Those coming from Sydney should continue past the Bulli Pass turn-off and take the Mt Ousley road. At the bottom of Mt Ousley take the left hand fork and continue to the second intersection. The Hall is on the right.

Further information on the open day and the doings of the Illawarra Users Group can be obtained from Jim O'Grady, PO Box 1775, Wollongong, NSW, 2500, or by phoning (042) 20 2783 in business hours or (042) 96 8050 after hours.

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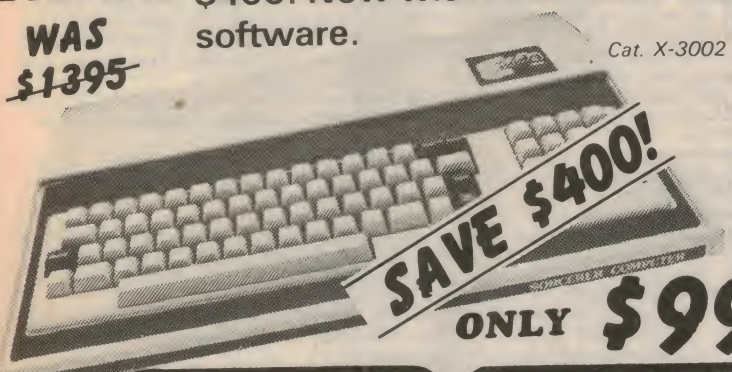

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Micropolis 1023/mod 2 add-on Drive

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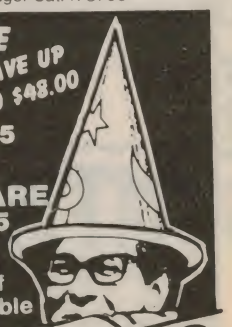

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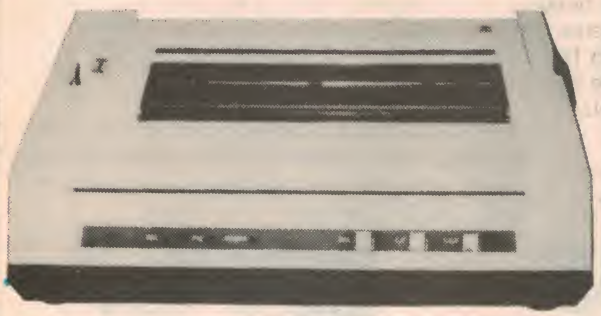


Pro/Writer Printer 8510

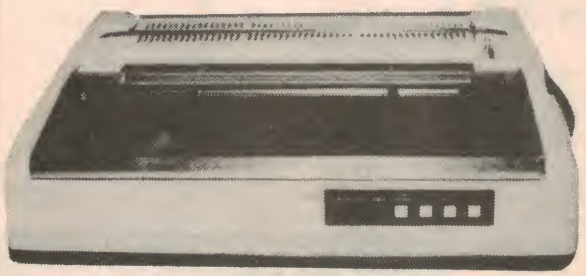
Print Features: Number of columns—136 col. max. Print Speed—120 CPS. Print Direction—Single-directional and Bidirectional, Switch Selectable. Throughput Speed—From 44 to 152 lpm. Character spacing (max. number of columns per line)—Pica 10 CPI (80), Double Width 5 CPI (40), Compressed Font 17 CPI (136), Double Width 8.5 CPI (68), Elite 12 CPI (96), Double Width 6 CPI (48), Proportional Double Width Proportional. Line Spacing—Variable to 1/144". Print Width—203 mm (8") max.
Forms Type: Fan Fold Roll or Cut Sheet: Width—113 mm to 254 mm (4.5" to 10.0"). Total Thickness—0.05 to 0.28 mm (0.002" to 0.011"). Number of Copies—Original + 3 copies nominal.
Form Feed: Method—Tractor or Friction. Form Loading—Either rear or top.
Interface—Serial: Method—EIA RS232-C and 20mA (40 & 60mA switchable option) Current Loop Serial Interface. Baud Rate (BPS)—110, 300, 600, 1200, 2400, 4800, 9600. Transmitting Method—Half Duplex. Synchronization—Asynchronous.
Interface—Parallel: Method—TTL compatible, 7-bit, parallel interface. Control Signals—ACK, BUSY, SELECT, DATA STB, INPUT PRIME FAULT, INPUT BUSY, PAPER EMPTY. Instruction Codes—(ASCII): CR, LF, VT, FF, CAN, SO, SI, DEL, DC1, DC2, DC3, DC4, GS, RS, US, FS, EM; GRAPHIC SYMBOLS: BIT GRAPHICS.
Error Detection: (1) Parity (VRC)—Odd, Even, No-parity. Switch selectable. (2) Framing Error—Stop bit check. (3) Overrun Error—Error is detected when data are received before the previous data have been processed.
Physical dimensions: 398 mm W x 120 mm H x 285 mm D (15.7" W x 4.7" H x 11.2" D).
Weight: 8.5 kg (18 lbs., 12 oz.)

P*$975 ($845 ex)
S$1,095 ($945 ex)**

Model 1550

The Model 1550 is a compact desk-top dot matrix serial impact printer used for data communication terminals, hardcopy of CRT displays, peripheral terminals for minicomputers and microcomputers, and small-sized business systems.
The character format is a dot matrix of 7(H) x 9)(V). or 8(H) x 8(V).
Print speed is 120 characters/second. Up to 136 characters can be printed per line at 10 CPI.
Its main features are: • Compact desk-top dot matrix printer • 136-column print • Light-weight • Low power-consumption • High-quality print • Bit image graphics • Graphic Symbols • Prints in six different languages • High reliability • Low cost.

P*$1,295 ($1,175 ex)
S$1,395 ($1,295 ex)**



F-10 Printmaster Daisy Wheel Printer

Print Speed: 40 CPS. **Print Method:** Static Print Impact. **Number of Printable Columns:** 136, 163, Variable. **Character Spacing:** 1/120 Inch (minimum). **Line Spacing:** 1/48. **Return Time:** 900 msec. **Line Feed Time** 40 msec. **Paper Width:** 406 mm (maximum). **Print Characters:** 96. **Printwheel:** Industry Standard 96 Character Wheel. **Interface:** Industry Standard 8-bit Parallel, RS232-C Compatible, X-ON, X-OFF, 12-bit Qume and Diablo Compatible. **Dimensions:** 574 mm W x 405 mm d x 153.5 mm H (22.5" W x 15.9" D x 6" H). **Weight:** 14 kg (30.8 lbs.) with cover and power supply. **Noise:** Less than 65 Db (1M from Platen, A Scale).

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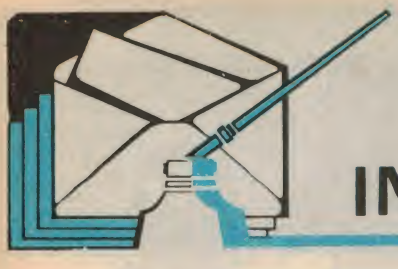


INFORMATION CENTRE

PHOTON-TORPEDO: I have recently constructed your Photon-Torpedo project from the September 1981 issue. I have experienced one difficulty with it. Both the 5th LED and the intersecting LED on the horizontal row do not come on at the right time. They pulse very faintly while other LEDS are lighting up. Since the intersecting LED doesn't come on, when the torpedo should have hit it, nothing happens (IE, no special sound is produced). The actual torpedo sound is functioning properly. (D.M.J., Balwyn, Vic.)

● We assume that you have a partial short across the two LEDs concerned or across the inputs of IC5c. This would prevent IC5c from working as it should and thus no "crash" noise is produced. Go over the board very carefully and look for fine solder splashes. If you cannot see any, check for shorts with your multimeter switched to an "ohms" range.

DIGITAL FREQUENCY DISPLAY: I recently purchased an FM stereo tuner kit from L. E. Chapman and noted with interest your digital frequency display which appeared in the October '82 issue.

What modifications are needed to enable the EA digital frequency display to be amalgamated with an FM stereo tuner? Can the display also be configured to act as an AM/FM display? (D. W., Scottsdale, Tas.)

● It would be relatively easy to adapt the display to FM. You would need to add a local oscillator buffer and prescaler which can run up to 120MHz. Fortunately this is relatively easy. Just refer to our December 1978 issue which featured the Playmaster AM/FM tuner.

There you will find the circuit of a one-transistor buffer which is very similar in configuration to the remote buffer stage for the digital display. Also featured is the National Semiconductor DS8629 100:1 prescaler. This would replace IC1 and IC2 as far as the FM function is concerned. You would also have to program the 4029 ICs to take into account the 10.7MHz intermediate frequency.

We have not addressed the problem of how to adapt the display to AM/FM operation but it could be done. However, it would probably be messy unless you arranged for electronic switching between the two functions.

The DS8629 is readily available from Dick Smith Electronics.

TRANSISTOR ASSISTED IGNITION: I read your article in December '79 about the TAI and bought a kit from Dick Smith, built it and promptly fitted the kit to my 65 Holden Panel Van 192 cu in, 4-speed (Australian) gearbox – and blew up the TAI (!!!) – wiring problem or burr under the BUX80 or 2N3055.

Not long after that we sold the Panel Van (not because of the TAI). I rebuilt the

In praise of Capacitor Discharge Ignition Systems:

In the TAI article in February 1983 you inserted a box debunking capacitor discharge ignition systems.

Let me start by saying that I began fiddling with CDI systems about 1960. To date I have made about 150 units. These were used in some of the top racing Minis in Australia (all without a single failure). One was fitted to a turbo-charged six cylinder racing boat. At one stage the boat flipped and sank. The unit despite being under water for about half an hour still functions today.

Most of the CDIs went to bread and butter cars with some exceptions, eg, a 12-cylinder Ferrari and a twin turbo-charged Falcon. In all these years I've had only one breakdown – caused by the owner fitting it himself in the wrong place and not using sealing compound on the lid of the box. It worked for about two weeks with the box half full of water before it finally cried enough.

Now let me answer all the points raised about CDI:

(1) Circuit Reliability: The above record speaks for itself, proven in circuit racing and other uses. It boils down to generously rated components, good dump caps, 800PIV 16A SCRs, fibreglass PC boards, and glued down larger components.

(2) Cross-firing: A lot of V8s have this problem even with standard ignition. My solution is very simple: I will not sell a CDI to a V8 owner unless he installs an ignition harness to my specifications. I also recommend getting rid of all carbon-impregnated ignition wires on all CDI-equipped cars.

(3) Four stroke engines with anti-pollution equipment fitted: I now run a Ford Laser with no problems whatsoever. Open road fuel consumption is slightly over 48mpg (1.5 litre, 5-speed).

(4) All automobile manufacturers are ruled by accountants. They spend millions to put all sorts of fuel-saving computers in but overlook a very basic fact. A good CDI system will save you at least 10% in fuel used.

(5) One fact not mentioned in your box is the often stated "it will not fire very lean mixtures".

Let's quote from one of my customers. A Holden Sandman panelvan, three persons plus several Great Danes in the back. Driven hard in the country (80 to 90mph) it got 38mpg. (This was due to a leak in the valley cover.)

A Mini panelvan with a 45mm Weber carburettor jetted for petrol. It ran on a 70% methanol 30% distilled water mixture without even enlarging the jets.

From all the above it is all too clear that a good CDI will run rings around any other system.

In closing, I would like to quote one more example of what a CDI can do in a turbo-charged engine. Private testing with Paul Gulson on Oran Park circuit we ran a 1310 Mini with iron 5 porthead at 33psi boost and 9500rpm. (J, de V. Prospect, NSW).

● Our comments were based on the experiences of a large number of readers. As far as we are concerned, CDIs are nowhere near as reliable as TAI circuits. Nor have we seen any evidence that TAIs are less economical in fuel consumption than CDI. We would expect the opposite.

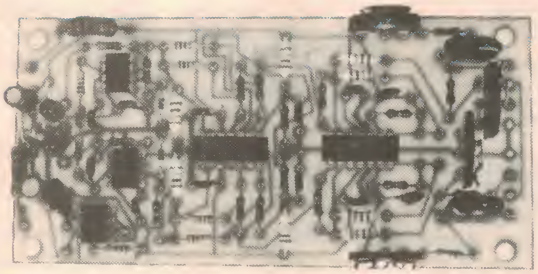
We also fail to see how the auto manufacturers are ruled by accountants if, as you say, they spend millions to install fuel saving computers.

Next Month in EA . . .

Electronic Effects Unit

A project for the musician or audio fiddler. It has reverb, echo, flanger, phaser and vibrato. You can use combinations of these effects to get some really offbeat sounds.

AMP OVERLOAD INDICATOR



Held over from this issue because of lack of space, this overload indicator can be connected to any solid state power amplifier and will indicate even the briefest of overloads causing as little as 0.1% THD. The circuit is immune to the effects of varying supply voltages or load impedance.

PLUS:

MAKE YOUR OWN RELAY

*Although these articles have been prepared for publication, circumstances may change the final content. However, we will make every attempt to include the articles featured here.

TAI with no burrs or wiring errors and promptly fitted the rebuilt TAI to my wife's 1977 "LB" Lancer Hatchback (Chrysler), this being much to her disgust.

Here lies a problem. The tacho doesn't work correctly with the TAI fitted (wired as prescribed). Any ideas please?

The other car in our stable is a '79 CM ELB Valiant 4.0L Manual which I believe the TAI is derived from (dwell extension). Will fitting the TAI MkII (Feb '83) make any difference? If so will it cause any upsets to the computer? And where in the wiring is the TAI fitted if worthwhile? The Valiant already has the pointless distributor. Thanking you for your assistance. (S. P., Kangaroo Flat, Vic.)

● There should be no problem in operating a tachometer when the TAI is fitted although it may be necessary to take the tacho input from the negative side of the coil (ie, collector of Q4) rather than from the points.

It would be pointless (pun intended) to fit the TAI to the Valiant since the system is essentially the same.

FLUORESCENT STARTER: I recently installed 4 x 18W TLD83 fluorescent tubes surrounding a bathroom vanity mirror. As you would know, the Philips TLD83 is a high efficiency 26mm "daylight" tube — and fairly expensive. With the usual "bimetallic" starters these tubes flash for an abnormally lengthy period before finally striking. It seemed that Leo Simpson's solid-state starter would be the answer.

The electronic starter worked well on conventional 37mm tubes, but not a glimmer on TLD83s, not even a faint flow from the filaments. Reducing the .015μF capacitor to .01μF made no noticeable difference. Raising the voltage on the ST2 by substituting 220kΩ and 270kΩ resistors for the 470kΩ and 100kΩ resistors, respectively, was however, part of the answer. Each end of the tube fluoresced but the tube did not illuminate through its entire length.

Complete fluorescence was finally effected by taping an earthing strip of foil along the full length of the tube. The flashing is now minimal as compared to the usual "bimetallic" starter.

The earthing strip could be a length of thin L-shaped metal, sprung against the tube. This type of tube earthing was common when one form of quick start circuitry was popular in the fifties. I used a strip of building insulation aluminium foil about 40mm wide to half surround the tube and so double as a silvered reflector (attached with adhesive tape and earthed).

I make mention of this modification as I understand from the SEC Authority that the Newcastle lamp manufacturers will be turning out more 26mm dia high efficiency tubes than the current "conventional" 37mm tubes by the end of '83. The modification I have made may not be optimum but it is certainly a big improvement. (A. S. Mt Eliza, Vic.)

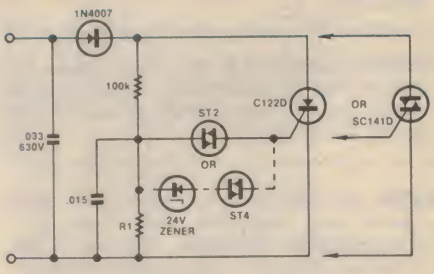
● Thank you for your interesting modification. As your letter and the other one on this page shows, the fluorescent starter circuit is not the complete answer to starting problems with many tubes. We have also had one complaint that the electronic starter burns out tube filaments. Have any readers experienced this?

FLUORESCENT STARTERS: I recently bought two fluorescent starter kits (EA October '82) from one of your advertisers (Rod Irving). On attempting assembly the 0.1μF capacitors were found to be of a type too large to fit the starter housing. In operation both devices worked sometimes.

A check of the waveforms suggested that the 0.1 snubber capacitor was too large, so the one in the starter was temporarily substituted. The gate trigger voltage was also marginal so the 470kΩ resistor was replaced by 330kΩ.

However it was apparent that the inclusion of a high voltage isolation diode would allow the use of a cheaper Triac for the switch. Tests also showed the ST2 could, if unavailable, be replaced by an ST4 in series with a 24V zener. At least 20 volts is required to generate sustaining current for the SCR. The starting time could also be reduced by reducing the time constant of the trigger circuit. The modified circuit is shown below. Note that an SC141D Triac can be directly substituted here for the C122D. This brings the price down to about $2.50.

Different starters are normally required for 20W or 40W single and single ballast dual 20W fittings. In the latter the tubes are wired in series so that available



voltage per tube is only half. To use electronic starters in these, the gate resistor network must be changed as per table:

Trigger device	ST2	ST4
20W or 40W single	22kΩ	18kΩ
20W dual	47kΩ	39kΩ

Unfortunately, the Philips Power Miser 26mm dia tubes cannot be started with this device, and in fact an attempt to do so with the published design is likely to cause the SCR to fail as the negative voltage at turn off exceeds 600 volts. The modified circuit won't fail, it just won't produce the 800V+ required to start these tubes.

The problem can be overcome with the aid of a starter wire, but that's another story. Altogether, an excellent device and thanks for the idea. Regards. (W. J., Nambucca Heads, NSW).

● While we find your modifications interesting, we fail to see how they make the circuit cheaper to build. For example, the C122E SCR is currently priced at 90 cents from Dick Smith Electronics while the SC141D Triac is priced at $1.45.

We do not recommend the use of the electronic starter in single-ballast dual 20W fittings as there is no way of knowing whether the starters will be correctly connected to ensure that both tubes light properly.

Electronics Australia Reader Service

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PC BOARD PATTERNS: High contrast, actual size transparencies: $3, including postage. Please specify positive or negative.

PROJECT QUERIES: Members of our technical staff are not normally available to discuss individual projects, either in person at our office, or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the last three years. Charge $3. We cannot provide lengthy answers, undertake special research, or discuss design changes. Nor can we provide any information on commercial equipment.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" or submitted without fee may be answered in the "Information Centre" pages, at the discretion of the Editor.

COMPONENTS: We do not sell electronic components. Prices and specifications should be sought from advertisers or agents.

BACK ISSUES: Available only until our stocks are exhausted. Within six months of publication, face value plus 30c for post and packing for each issue. Seven months and older, $3 (includes post and packing and storage fee).

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Chippendale, 2008.

MARKETPLACE

DISPLAY ADVERTS IN MARKETPLACE are available in sizes from a minimum of 2cm x 1 col rated at $15 for a col cm.

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CLOSING DATE is six weeks prior to the on-sale date. Issues are on sale the first Wednesday of each month.

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OSBORNE 1 GRAPHICS SOFTWARE: Games and practical applications. For information send SAE to: Aeon Software, Suite 2, 19 Godfrey Street, Campbell, ACT 2601.

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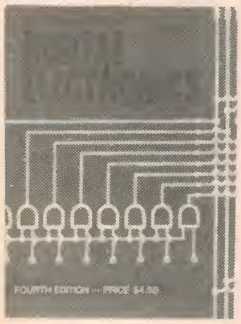

Electronics is going digital. This book can help YOU go right along with it.

Electronic equipment now plays an important role in almost every field of human endeavour. And every day, more and more electronic equipment is "going digital". Even professional engineers and technicians find it hard to keep pace. In order to understand new developments, you need a good grounding in basic digital concepts, and An Introduction to Digital Electronics can give you that grounding. Tens of thousands of people — engineers, technicians, students and hobbyists — have used the previous editions of this book to find out what the digital revolution is all about. The fourth edition has been updated and expanded, to make it of even greater value.

Available from "Electronics Australia", 57 Regent St, Chippendale 2008. PRICE $4.50 OR by mail order from "Electronics Australia", PO Box 163, Chippendale 2008. PRICE $5.40.

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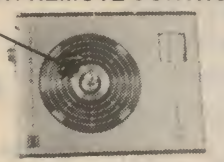

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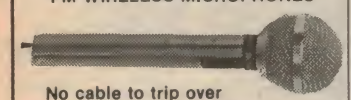

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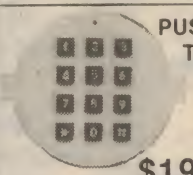

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6160	30cm	Twin cone	8 or 15 Ohms	65	50-15000	30	$29.50 or $52.00
6180	30cm	Foam surround	8 Ohms	30	30-4000	60	$34.95 or $64.00
4310	38cm	Straight surround	8-15 Ohms	45	40-6000	60	$63.00 or $120.00
4510	38cm	Straight surround	8-15 Ohms	45	40-6000	100	$84.00 or $156.00
4350	38cm	Hi-Fi	8-15 Ohms	30	30-4000	120	$63.00 or $120.00

Pack — Postage add for one 30cm model. NSW $3.50. Interstate $5. For two 30cm models. NSW $5. Interstate $7. For one 38cm model. NSW $4.00. Interstate $6. For two 38cm models. NSW $7. Interstate $8.50.

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Prices including postage are:

Holders: $5.50 NSW; $5.60 other states: or six for $29.00 NSW; $31.50 other states, $A33.00 NZ.

Binders: $7.00 NSW; $8.50 other states: or six for $33.00 NSW; $36.00 other states, $A37.00 NZ.

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Some readers have problems obtaining PC boards and front panels for projects. Many of our advertisers sell these items and their advertisements should be checked in the first instance. Failing that, below is a list of firms which produce or sell PC boards and front panels.

NSW

Dick Smith Electronics,
125 York Street,
Sydney, 2000.
Telephone 290 3377.
DSE also has branches and resellers throughout Australia.

Electronic Agencies,
115-117 Parramatta Road,
Concord, 2137.
Telephone 745 3077.

117 York Street,
Sydney 2000.
Telephone 29 2098.

Jaycar Pty Ltd,
125 York Street,
Sydney 2000.
Telephone 264 6688.

Radio Despatch Service,
869 George Street,
Sydney 2000.
Telephone 211 0816.

RCS Radio Pty Ltd,
651 Forest Road,
Bexley, NSW 2207.
Telephone: 587 3491

VIC.

Rod Irving Electronics,
425 High Street,
Northcote, 3070.
Telephone 489 8131.

Kalextronics,
101 Burgundy Street,
Heidelberg 3084.
Telephone 743 1011.

Shop 11,
Regional Shopping Centre,
Melton 3338.
Telephone 743 1011.

Sunbury Printed Circuits,
Lot 14, Factory 3,
MacDougal Road,
Sunbury 3429.
Telephone 744 2714

Altronics,
105 Stirling Street,
Perth 6000.
Telephone 328 1599.

Jemal Products,
8/120 Briggs Street,
Welshpool, 6106.

N.Z.

Marday Services,
PO Box 19 189,
Avondale, Auckland.

Mini Tech Manufacturing Co Ltd,
PO Box 9194,
Newmarket.

Printed Circuits Limited,
PO Box 4248,
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RS-232C Built-in	YES	NO	YES	NO
Sound	YES	YES	YES	YES
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Programmable Characters	YES	NO	NO	NO
Upper/Lower Case Characters	YES	YES	YES	YES
Dedicated Graphics	YES	YES	NO	YES
User-Programmable Function keys	8	YES	NO	NO
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